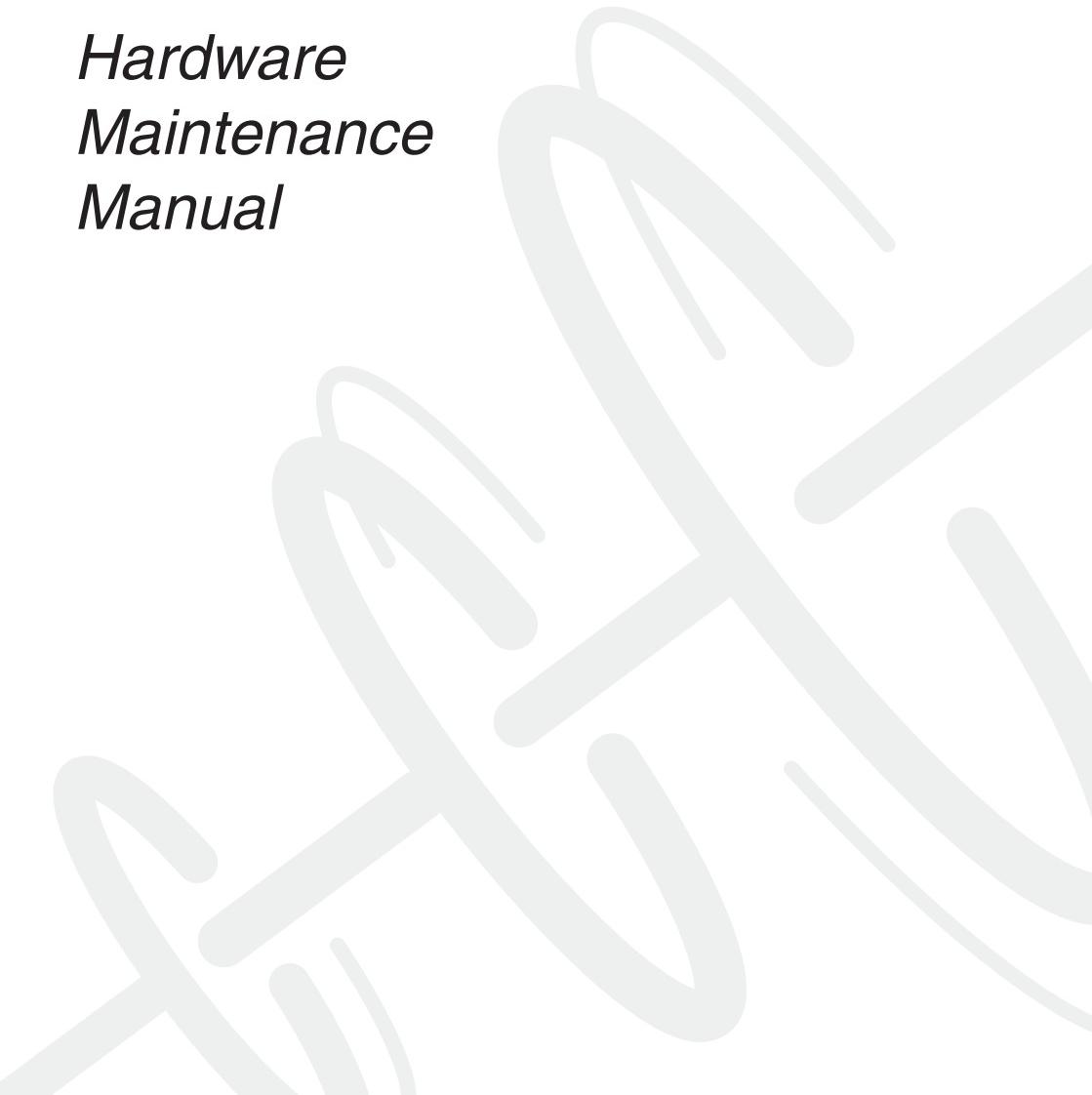


lenovo

Lenovo G460e/G560e

*Hardware
Maintenance
Manual*



Note:

Before using this information and the product it supports, be sure to read the general information under "Notices" on page 91.

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About this manual

This manual contains service and reference information for the following Lenovo product:

Lenovo G460e/G560e

Use this manual to troubleshoot problems.

The manual is divided into the following sections:

- The common sections provide general information, guidelines, and safety information required for servicing computers.
- The product-specific section includes service, reference, and product-specific parts information.

Important:

This manual is intended only for trained servicers who are familiar with Lenovo products. Use this manual to troubleshoot problems effectively. Before servicing a Lenovo product, make sure to read all the information under “Safety information” on page 1 and “Important service information” on page 16.

Safety information

This chapter presents the following safety information that you need to get familiar with before you service a Lenovo computer:

- “General safety” on page 2
- “Electrical safety” on page 3
- “Safety inspection guide” on page 5
- “Handling devices that are sensitive to electrostatic discharge” on page 6
- “Grounding requirements” on page 6
- “Safety notices: multilingual translations” on page 7
- “Laser compliance statement” on page 14

General safety

Follow these rules below to ensure general safety:

- Observe a good housekeeping in the area where the machines are put during and after the maintenance.
- When lifting any heavy object:
 1. Make sure that you can stand safely without slipping.
 2. Distribute the weight of the object equally between your feet.
 3. Use a slow lifting force. Never move suddenly or twist when you attempt to lift it.
 4. Lift it by standing or pushing up with your leg muscles; this action could avoid the strain from the muscles in your back. Do not attempt to lift any object that weighs more than 16 kg (35 lb) or that you think is too heavy for you.
- Do not perform any action that causes hazards to the customer, or that makes the machine unsafe.
- Before you start the machine, make sure that other service representatives and the customer are not in a hazardous position.
- Place removed covers and other parts in a safe place, keeping them away from all personnel, while you are servicing the machine.
- Keep your toolcase away from walk areas so that other people will not trip it over.
- Do not wear loose clothing that can be trapped in the moving parts of the machine. Make sure that your sleeves are fastened or rolled up above your elbows. If your hair is long, fasten it.
- Insert the ends of your necktie or scarf inside clothing or fasten it with the nonconductive clip, about 8 centimeters (3 inches) from the end.
- Do not wear jewelry, chains, metal-frame eyeglasses, or metal fasteners for your clothing.
Attention: Metal objects are good electrical conductors.
- Wear safety glasses when you are hammering, drilling, soldering, cutting wire, attaching springs, using solvents, or working in any other conditions that may be hazardous to your eyes.
- After service, reinstall all safety shields, guards, labels, and ground wires. Replace any safety device that is worn or defective.
- Reinstall all covers correctly before returning the machine to the customer.
- Fan louvers on the machine help to prevent the overheating of internal components. Do not obstruct fan louvers or cover them with labels or stickers.

Electrical safety

Observe the following rules when working on electrical equipments.

Important:

Use only approved tools and test equipments. Some hand tools have handles covered with a soft material that does not insulate you when working with live electrical currents.

Many customers have rubber floor mats near their machines that contain small conductive fibers to decrease electrostatic discharges. Do not use such kind of mat to protect yourself from electrical shock.

- Find the room emergency power-off (EPO) switch, disconnecting the switch or electrical outlet. If an electrical accident occurs, you can then operate the switch or unplug the power cord quickly.
 - Do not work alone under hazardous conditions or near the equipment that has hazardous voltages.
 - Disconnect all power before:
 - Performing a mechanical inspection
 - Working near power supplies
 - Removing or installing main units
 - Before you start to work on the machine, unplug the power cord. If you cannot unplug it, ask the customer to power-off the wall box that supplies power to the machine, and to lock the wall box in the off position.
 - If you need to work on a machine that has exposed electrical circuits, observe the following precautions:
 - Ensure that another person, familiar with the power-off controls, is near you.
Attention: Another person must be there to switch off the power, if necessary.
 - Use only one hand when working with powered-on electrical equipment; keep the other hand in your pocket or behind your back.
Attention: An electrical shock can occur only when there is a complete circuit. By observing the above rule, you may prevent a current from passing through your body.
 - When using testers, set the controls correctly and use the approved probe leads and accessories for that tester.
 - Stand on suitable rubber mats (obtained locally, if necessary) to insulate you from grounds such as metal floor strips and machine frames.
- Observe the special safety precautions when you work with very high voltages; instructions for these precautions are in the safety sections of maintenance information. Be extremely careful when you measure the high voltages.
- Regularly inspect and maintain your electrical hand tools for safe operational condition.
 - Do not use worn or broken tools and testers.
 - Never assume that power has been disconnected from a circuit. First, check it to make sure that it has been powered off.

- Always look carefully for possible hazards in your work area. Examples of these hazards are moist floors, nongrounded power extension cables, power surges, and missing safety grounds.
- Do not touch live electrical circuits with the reflective surface of a plastic dental mirror. The surface is conductive; such touching can cause personal injury and machine damage.
- Do not service the following parts with the power on when they are removed from their normal operating places in a machine:
 - Power supply units
 - Pumps
 - Blowers and fans
 - Motor generatorsand similar units. (This practice ensures correct grounding of the units.)
- If an electrical accident occurs:
 - Caution: do not become a victim yourself.
 - Switch off the power.
 - Send the victim to get medical aid.

Safety inspection guide

The purpose of this inspection guide is to assist you in identifying potential unsafe conditions. As each machine was designed and built, required safety items were installed to protect users and service personnel from injury. This guide addresses only those items. You should use good judgment to identify potential safety hazards according to the attachment of non-Lenovo features or options not covered by this inspection guide.

If any unsafe conditions are present, you must determine how serious the apparent hazard could be and whether you can continue without first correcting the problem.

Consider these conditions and the safety hazards they present:

- Electrical hazards, especially primary power (primary voltage on the frame can cause serious or fatal electrical shock)
- Explosive hazards, such as a damaged CRT face or a bulging capacitor
- Mechanical hazards, such as loose or missing hardware

To determine whether there are any potential unsafe conditions, use the following checklist at the beginning of every service task. Begin the checks with the power off, and the power cord disconnected.

Checklist:

1. Check exterior covers for damage (loose, broken, or sharp edges).
2. Turn off the computer. Disconnect the power cord.
3. Check the power cord for:
 - a. A third-wire ground connector in good condition. Use a meter to measure third-wire ground continuity for 0.1 ohm or less between the external ground pin and the frame ground.
 - b. The power cord should be the type specified in the parts list.
 - c. Insulation must not be frayed or worn.
4. Check for cracked or bulging batteries.
5. Remove the cover.
6. Check for any obvious non-Lenovo alterations. Use good judgment as to the safety of any non-Lenovo alterations.
7. Check inside the unit for any obvious unsafe conditions, such as metal filings, contamination, water or other liquids, or signs of fire or smoke damage.
8. Check for worn, frayed, or pinched cables.
9. Check that the power-supply cover fasteners (screws or rivets) have not been removed or tampered with.

Handling devices that are sensitive to electrostatic discharge

Any computer part containing transistors or integrated circuits (ICs) should be considered sensitive to electrostatic discharge (ESD). ESD damage can occur when there is a difference in charge between objects. Protect against ESD damage by equalizing the charge so that the machine, the part, the work mat, and the person handling the part are all at the same charge.

Notes:

1. Use product-specific ESD procedures when they exceed the requirements noted here.
2. Make sure that the ESD protective devices you use have been certified (ISO 9000) as fully effective.

When handling ESD-sensitive parts:

- Keep the parts in protective packages until they are inserted into the product.
- Avoid contact with other people.
- Wear a grounded wrist strap against your skin to eliminate static on your body.
- Prevent the part from touching your clothing. Most clothing is insulative and retains a charge even when you are wearing a wrist strap.
- Use the black side of a grounded work mat to provide a static-free work surface. The mat is especially useful when handling ESD-sensitive devices.
- Select a grounding system, such as those listed below, to provide protection that meets the specific service requirement.

Notes:

The use of a grounding system to guard against ESD damage is desirable but not necessary.

- Attach the ESD ground clip to any frame ground, ground braid, or green-wire ground.
- When working on a double-insulated or battery-operated system, use an ESD common ground or reference point. You can use coax or connector-outside shells on these systems.
- Use the round ground prong of the ac plug on ac-operated computers.

Grounding requirements

Electrical grounding of the computer is required for operator safety and correct system function. Proper grounding of the electrical outlet can be verified by a certified electrician.

Safety notices: multilingual translations

The safety notices in this section are provided in English, French, German, Hebrew, Italian, Japanese, and Spanish.

Safety notice 1

Before the computer is powered on after FRU replacement, make sure all screws, springs, and other small parts are in place and are not left loose inside the computer. Verify this by shaking the computer and listening for rattling sounds. Metallic parts or metal flakes can cause electrical shorts.

Avant de remettre l'ordinateur sous tension après remplacement d'une unité en clientèle, vérifiez que tous les ressorts, vis et autres pièces sont bien en place et bien fixées. Pour ce faire, secouez l'unité et assurez-vous qu'aucun bruit suspect ne se produit. Des pièces métalliques ou des copeaux de métal pourraient causer un court-circuit.

Bevor nach einem FRU-Austausch der Computer wieder angeschlossen wird, muß sichergestellt werden, daß keine Schrauben, Federn oder andere Kleinteile fehlen oder im Gehäuse vergessen wurden. Der Computer muß geschüttelt und auf Klappergeräusche geprüft werden. Metallteile oder splitter können Kurzschlüsse erzeugen.

לפני הפעלת המחשב לאחר החלפת FRU יש לוודא
שכלי הרכבה, הקופסאות והקיטים תחזרו נמצאים
במקומות המקוריים והמשיכם ללווי תחודש מתחם. כדי לוודא
זאת, שטלול תא המחਬות ויתהשיבו נגדי קילוח טשושה.
לפי או בסביב מוגנת לוללים נגדיים לשעליהם.

Prima di accendere l'elaboratore dopo che é stata effettuata la sostituzione di una FRU, accertarsi che tutte le viti, le molle e tutte le altre parti di piccole dimensioni siano nella corretta posizione e non siano sparse all'interno dell'elaboratore. Verificare ciò scuotendo l'elaboratore e prestando attenzione ad eventuali rumori; eventuali parti o pezzetti metallici possono provocare cortocircuiti pericolosi.

FRU の交換後、コンピュータの電源を入れる前に、ねじ、バネ、その他の小さな部品がすべて正しい位置にあり、またコンピュータの内部で緩んでいないことを確認してください。

これを確認するには、コンピュータを振って、カチャカチャと音がしないか確かめます。金属部品や金属破片はショートの原因になることがあります。

Antes de encender el sistema despues de sustituir una FRU, compruebe que todos los tornillos, muelles y demás piezas pequeñas se encuentran en su sitio y no se encuentran sueltas dentro del sistema. Compruébelo agitando el sistema y escuchando los posibles ruidos que provocarían. Las piezas metálicas pueden causar cortocircuitos eléctricos.

Safety notice 2**⚠ DANGER**

Some standby batteries contain a small amount of nickel and cadmium. Do not disassemble a standby battery, recharge it, throw it into fire or water, or short-circuit it. Dispose of the battery as required by local ordinances or regulations. Use only the battery in the appropriate parts listing. Use of an incorrect battery can result in ignition or explosion of the battery.

Certaines batteries de secours contiennent du nickel et du cadmium. Ne les démontez pas, ne les rechargez pas, ne les exposez ni au feu ni à l'eau. Ne les mettez pas en court-circuit. Pour les mettre au rebut, conformez-vous à la réglementation en vigueur. Lorsque vous remplacez la pile de sauvegarde ou celle de l'horloge temps réel, veillez à n'utiliser que les modèles cités dans la liste de pièces détachées adéquate. Une batterie ou une pile inappropriée risque de prendre feu ou d'explorer.

Die Bereitschaftsbatterie, die sich unter dem Diskettenlaufwerk befindet, kann geringe Mengen Nickel und Cadmium enthalten. Sie darf nicht zerlegt, wiederaufgeladen, kurzgeschlossen, oder Feuer oder Wasser ausgesetzt werden. Bei der Entsorgung die örtlichen Bestimmungen für Sondermüll beachten. Beim Ersetzen der Bereitschafts-oder Systembatterie nur Batterien des Typs verwenden, der in der Ersatzteilliste aufgeführt ist. Der Einsatz falscher Batterien kann zu Entzündung oder Explosion führen.

טלולות המטען מכילו מינרלים כבאות קתנה
של נילק וקadmיום. אין לפרק או לטלול המטען,
לטשו או מהוורר אותו. לא שולחן או
למברס או לבלאי אותו. יש לשליך את הטלולה
נדבש על ידי תומכות וחוקקים מתקנים מיוחדים. יש
להשמנש כי הטלולה הומוגנית ביחסות התלקים
המוחדרים. שימוש בטוללה לא תנתנו על
הזרם לתמצת או התפוצצות של הסוללה.

Alcune batterie di riserva contengono una piccola quantità di nichel e cadmio. Non smontarle, ricaricarle, gettarle nel fuoco o nell'acqua né cortocircuitarle. Smontarle secondo la normativa in vigore (DPR 915/82, successive disposizioni e disposizioni locali). Quando si sostituisce la batteria dell'RTC (real time clock) o la batteria di supporto, utilizzare soltanto i tipi inseriti nell'appropriato Catalogo parti. L'impiego di una batteria non adatta potrebbe determinare l'incendio o l'esplosione della batteria stessa.

予備バッテリーの中には少量のニッケルとカドミウムが含まれているものがあります。したがって、予備バッテリーの分解、再充電、火または水の中への投棄、またはショートさせることは決して行わないでください。バッテリーを廃棄する場合は地方自治体の条例に従ってください。適切なバーツ・リストにあるバッテリーだけを使用してください。誤ったバッテリーを使用すると、バッテリーが発火したり、爆発したりすることがあります。

Algunas baterías de reserva contienen una pequeña cantidad de níquel y cadmio. No las desmonte, ni recargue, ni las eche al fuego o al agua ni las cortocircuite. Deséchelas tal como dispone la normativa local. Utilice sólo baterías que se encuentren en la lista de piezas. La utilización de una batería no apropiada puede provocar la ignición o explosión de la misma.

Safety notice 3**⚠ DANGER**

The battery pack contains small amounts of nickel. Do not disassemble it, throw it into fire or water, or short-circuit it. Dispose of the battery pack as required by local ordinances or regulations. Use only the battery in the appropriate parts listing when replacing the battery pack. Use of an incorrect battery can result in ignition or explosion of the battery.

La batterie contient du nickel. Ne la démontez pas, ne l'exposez ni au feu ni à l'eau. Ne la mettez pas en court-circuit. Pour la mettre au rebut, conformez-vous à la réglementation en vigueur. Lorsque vous remplacez la batterie, veillez à n'utiliser que les modèles cités dans la liste de pièces détachées adéquate. En effet, une batterie inappropriée risque de prendre feu ou d'exploser.

Akkus enthalten geringe Mengen von Nickel. Sie dürfen nicht zerlegt, wiederaufgeladen, kurzgeschlossen, oder Feuer oder Wasser ausgesetzt werden. Bei der Entsorgung die örtlichen Bestimmungen für Sondermüll beachten. Beim Ersetzen der Batterie nur Batterien des Typs verwenden, der in der Ersatzteilliste aufgeführt ist. Der Einsatz falscher Batterien kann zu Entzündung oder Explosion führen.

מארז סוללה מכיל מינרלים של ניקל וטיטניום. אין לפקר את מארז הסוללה, להשליך אותו למים או למים או לכינור אותו. יש לטפל את מארז הסוללה בטיפול נורווני או תוקף מומתקים. יש להשמיש רק סוללה במקומם המקורי. בום חלולות המשמש בטבילה אל תוך חלולות המארז או הטעינה עליה. על גורם היגיינה או הטעינה על הסוללה.

La batteria contiene piccole quantità di nichel. Non smontarla, gettarla nel fuoco o nell'acqua né cortocircuitarla. Smaltirla secondo la normativa in vigore (DPR 915/82, successive disposizioni e disposizioni locali). Quando si sostituisce la batteria, utilizzare soltanto i tipi inseriti nell'appropriato Catalogo parti. L'impiego di una batteria non adatta potrebbe determinare l'incendio o l'esplosione della batteria stessa.

バッテリー・パックには少量のニッケルが含まれています。バッテリー・パックを分解したり、火または水の中に投げ込んだり、ショートさせないでください。バッテリー・パックの廃棄にあたっては、地方自治体の条例または規則に従ってください。バッテリー・パックを交換するときは、適切なパーツ・リストにあるバッテリーだけを使用してください。誤ったバッテリーを使用すると、バッテリーが発火したり、爆発したりすることがあります。

Las baterías contienen pequeñas cantidades de níquel. No las desmonte, ni recargue, ni las eche al fuego o al agua ni las cortocircuite. Deséchelas tal como dispone la normativa local. Utilice sólo baterías que se encuentren en la lista de piezas al sustituir la batería. La utilización de una batería no apropiada puede provocar la ignición o explosión de la misma.

Safety notice 4**⚠ DANGER**

The lithium battery can cause a fire, an explosion, or a severe burn. Do not recharge it, remove its polarized connector, disassemble it, heat it above 100°C (212°F), incinerate it, or expose its cell contents to water. Dispose of the battery as required by local ordinances or regulations. Use only the battery in the appropriate parts listing. Use of an incorrect battery can result in ignition or explosion of the battery.

La pile de sauvegarde contient du lithium. Elle présente des risques d'incendie, d'explosion ou de brûlures graves. Ne la rechargez pas, ne retirez pas son connecteur polarisé et ne la démontez pas. Ne l'exposez pas à une température supérieure à 100°C, ne la faites pas brûler et n'en exposez pas le contenu à l'eau. Mettez la pile au rebut conformément à la réglementation en vigueur. Une pile inappropriée risque de prendre feu ou d'exploser.

Die Systembatterie ist eine Lithiumbatterie. Sie kann sich entzünden, explodieren oder schwere Verbrennungen hervorrufen. Batterien dieses Typs dürfen nicht aufgeladen, zerlegt, über 100 C erhitzt oder verbrannt werden. Auch darf ihr Inhalt nicht mit Wasser in Verbindung gebracht oder der zur richtigen Polung angebrachte Verbindungsstecker entfernt werden. Bei der Entsorgung die örtlichen Bestimmungen für Sondermüll beachten. Beim Ersetzen der Batterie nur Batterien des Typs verwenden, der in der Ersatzteilliste aufgeführt ist. Der Einsatz falscher Batterien kann zu Entzündung oder Explosion führen.

סוללה הליטיום עלולה לזרום לשריפה, להחטפות או למוות. לא ניתן לאחסן או לטעון מודול, לשלל את המטען המקורי, לטעון מחדש את תאי סוללה אחד או יותר 100 ל'ל שורף או תאי סוללה אחד ועוד או יותר. אין לשגר או לזרע תאי סוללה נבדך להשראת תא תאי הסוללה המקורי. יש לשליך תא סוללה נבדך בתקינות ובוחנים מתקיימים. יש להשמיש רק תא סוללה תואם בתקינות וברישום התאים המקוריים. שימוש בסוללה אחרת עלול לגרום לשרפה או לחטפות.

La batteria di supporto e una batteria al litio e può incendiarsi, esplodere o procurare gravi ustioni. Evitare di ricaricarla, smontarla il connettore polarizzato, smontarla, riscalarla ad una temperatura superiore ai 100 gradi centigradi, incenderla o gettarla in acqua. Smaltirla secondo la normativa in vigore (DPR 915/82, successive disposizioni e disposizioni locali). L'impiego di una batteria non adatta potrebbe determinare l'incendio o l'esplosione della batteria stessa.

リチウム・バッテリーは、火災、爆発、または重症のやけどを引き起こすことがあります。バッテリーチャージ、バッテリーの充電、その極性コネクターの取り外し、バッテリー本体の分解、100°C(212°F)以上への加熱、焼却、電池の中身を水に浸すことなどはしないでください。バッテリーを廃棄する場合は地方自治体の条例に従ってください。適切なバッテリー・リストにあるバッテリーだけを使用してください。誤ったバッテリーを使用すると、バッテリーが発火したり、爆発したりすることがあります。

La batería de repuesto es una batería de litio y puede provocar incendios, explosiones o quemaduras graves. No la recargue, ni quite el conector polarizado, ni la desmonte, ni caliente por encima de los 100°C (212°F), ni la incinere ni exponga el contenido de sus celdas al agua. Deséchela tal como dispone la normativa local.

Safety notice 5

If the LCD breaks and the fluid from inside the LCD gets into your eyes or on your hands, immediately wash the affected areas with water at least for 15 minutes. Seek medical care if any symptoms caused by the fluid are present after washing.

Si le panneau d'affichage à cristaux liquides se brise et que vous recevez dans les yeux ou sur les mains une partie du fluide, rincez-les abondamment pendant au moins quinze minutes. Consultez un médecin si des symptômes persistent après le lavage.

Die Leuchtstoffröhre im LCD-Bildschirm enthält Quecksilber. Bei der Entsorgung die örtlichen Bestimmungen für Sondermüll beachten. Der LCD-Bildschirm besteht aus Glas und kann zerbrechen, wenn er unsachgemäß behandelt wird oder der Computer auf den Boden fällt. Wenn der Bildschirm beschädigt ist und die darin befindliche Flüssigkeit in Kontakt mit Haut und Augen gerät, sollten die betroffenen Stellen mindestens 15 Minuten mit Wasser abgespült und bei Beschwerden anschließend ein Arzt aufgesucht werden.

אם מסך הNBC של LCD נזק או נוזל חומר המסך בא מבנים עם ניירם או ריצוף, תארח אותו ממים מייד וריבת 15 דקות לפחות. נו לנקות עירה רפואיים אם סימני הנזק ניכרים מהגעה עם הנוזל ממשיכם לאחר החיטפיה.

Nel caso che caso l'LCD si dovesse rompere ed il liquido in esso contenuto entrasse in contatto con gli occhi o le mani, lavare immediatamente le parti interessate con acqua corrente per almeno 15 minuti; poi consultare un medico se i sintomi dovessero permanere.

LCD が破損し、LCD 中の液体が目に入ったり、手に触れたりした場合は、液体が触れた部分を少なくとも 15 分間洗い流してください。洗い流した後に、液体によって何らかの症状が現れた場合は、医師の治療を受けてください。

Si la LCD se rompe y el fluido de su interior entra en contacto con sus ojos o sus manos, lave inmediatamente las áreas afectadas con agua durante 15 minutos como mínimo. Obtenga atención médica si se presenta algún

Safety notice 6**⚠ DANGER**

To avoid shock, do not remove the plastic cover that protects the lower part of the inverter card.

Afin d'éviter tout risque de choc électrique, ne retirez pas le cache en plastique protégeant la partie inférieure de la carte d'alimentation.

Aus Sicherheitsgründen die Kunststoffabdeckung, die den unteren Teil der Spannungswandlerplatine umgibt, nicht entfernen.

כדי למנוע חתך חשמלי, אינן להסיר את מסכת הפלטטיון.
המנן על להיקח מהחומר של הכרטיס החפות.

Per evitare scosse elettriche, non rimuovere la copertura in plastica che avvolge la parte inferiore della scheda invertitore.

感電を防ぐため、インバーター・カードの下部を保護しているプラスチック・カバーを外さないでください。

Para evitar descargas, no quite la cubierta de plástico que rodea la parte baja de la tarjeta invertida.

Safety notice 7**⚠ DANGER**

Though the main batteries have low voltage, a shorted or grounded battery can produce enough current to burn personnel or combustible materials.

Bien que le voltage des batteries principales soit peu élevé, le court-circuit ou la mise à la masse d'une batterie peut produire suffisamment de courant pour brûler des matériaux combustibles ou causer des brûlures corporelles graves.

Obwohl Hauptbatterien eine niedrige Spannung haben, können sie doch bei Kurzschluß oder Erdung genug Strom abgeben, um brennbare Materialien zu entzünden oder Verletzungen bei Personen hervorzurufen.

אף שהbateries הראשיות הן בעלות מתח נמוך, סוללה מוקצנת או מוגrounded עליה להפוך בוד מסתיק לגורם כיווית או להצתת חומרים דיליפ...
אף שהbateries הראשיות הן בעלות מתח נמוך, סוללה מוקצנת או מוגrounded עליה להפוך בוד מסתיק לגורם כיווית או להצתת חומרים דיליפ...

Sebbene le batterie di alimentazione siano a basso voltaggio, una batteria in corto circuito o a massa può fornire corrente sufficiente da bruciare materiali combustibili o provocare ustioni ai tecnici di manutenzione.

メイン・バッテリーの電圧は低くても、ショートしたり、接地したバッテリーが、作業者にやけどを負わせたり、可燃物を燃やすだけの電流を発生させる場合があります。

Aunque las baterías principales tienen un voltaje bajo, una batería cortocircuitada o con contacto a tierra puede producir la corriente suficiente como para quemar material combustible o provocar quemaduras en el personal.

Safety notice 8

⚠ DANGER

Before removing any FRU, turn off the computer, unplug all power cords from electrical outlets, remove the battery pack, and then disconnect any interconnecting cables.

Avant de retirer une unité remplaçable en clientèle, mettez le système hors tension, débranchez tous les cordons d'alimentation des socles de prise de courant, retirez la batterie et déconnectez tous les cordons d'interface.

Die Stromzufuhr muß abgeschaltet, alle Stromkabel aus der Steckdose gezogen, der Akku entfernt und alle Verbindungskabel abgenommen sein, bevor eine FRU entfernt wird.

לפני סילוק FRU כלשהו, יש לכבות את המחשב.
לטוק את כל החוטים טעוי תחוצב, להוציא
את אנחי הוללה, וא' למתך בכלל חיבורי אחרים.
אם יש פailer.

Prima di rimuovere qualsiasi FRU, spegnere il sistema, scollegare dalle prese elettriche tutti i cavi di alimentazione, rimuovere la batteria e poi scollegare i cavi di interconnessione.

FRUを取り外す前に、 ThinkPad の電源を切って、すべての電源コードをコンセントから外してください。次に、バッテリー・パックを外し、相互接続ケーブルを外してください。

Antes de quitar una FRU, apague el sistema, desenchufe todos los cables de las tomas de corriente eléctrica, quite la batería y, a continuación, desconecte cualquier cable de conexión entre dispositivos.

Laser compliance statement

Some models of Lenovo computer are equipped from the factory with an optical storage device such as a CD-ROM drive or a DVD-ROM drive. Such devices are also sold separately as options. If one of these drives is installed, it is certified in the U.S. to conform to the requirements of the Department of Health and Human Services 21 Code of Federal Regulations (DHHS 21 CFR) Subchapter J for Class 1 laser products. Elsewhere, the drive is certified to conform to the requirements of the International Electrotechnical Commission (IEC) 825 and CENELEC EN 60 825 for Class 1 laser products.

If a CD-ROM drive, a DVD-ROM drive, or another laser device is installed, note the following:

CAUTION

Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.

O uso de controles, ajustes ou desempenho de procedimentos diferentes daqueles aqui especificados pode resultar em perigosa exposição à radiação.

凡未在这里指明的任何控制用法、调整、行为，
都会导致严重后果。

Pour éviter tout risque d'exposition au rayon laser, respectez les consignes de réglage et d'utilisation des commandes, ainsi que les procédures décrites.

Werden Steuer- und Einstellelemente anders als hier festgesetzt verwendet, kann gefährliche Laserstrahlung auftreten.

Az itt előírt eljárásoktól, beállításoktól és vezérlésekktől eltérő a lézersugárzás veszélye miatt kockázatos !

L'utilizzo di controlli, regolazioni o l'esecuzione di procedure diverse da quelle specificate possono provocare l'esposizione a.

Использование элементов настройки и выполнение процедур иных, чем указано здесь, может привести к опасному радиационному облучению.

Použitie kontrol, úprav alebo iných vykonaní od iných výrobcov, ako je v tomto specifikované, mohlo by mať za následok nebezpečenstvo vystavenia sa vyzárovaniu.

本書で指定された内容以外の、お客様による整備、調整、または手順を行った場合、レーザー光の放射の危険があります。

El uso de controles o ajustes o la ejecución de procedimientos distintos de los aquí especificados puede provocar la exposición a radiaciones peligrosas.

Opening the CD-ROM drive, the DVD-ROM drive, or any other optical storage device could result in exposure to hazardous laser radiation. There are no serviceable parts inside those drives. **Do not open.**

A CD-ROM drive, a DVD-ROM drive, or any other storage device installed may contain an embedded Class 3A or Class 3B laser diode. Note the following:

 **DANGER**

Emits visible and invisible laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

Radiação por raio laser ao abrir. Não olhe fixo no feixe de luz, não olhe diretamente por meio de instrumentos ópticos e evite exposição direta com o feixe de luz.

开启时会有激光发射时。请勿盯视激光光束，请勿直接查看视觉仪器，并且避免直接接触在激光光束之中。

Rayonnement laser si carter ouvert. Évitez de fixer le faisceau, de le regarder directement avec des instruments optiques, ou de vous exposer au rayon.

Laserstrahlung bei geöffnetem Gerät. Nicht direkt oder über optische Instrumente in den Laserstrahl sehen und den Strahlungsbereich meiden.

Kinyitáskor lézersugár ! Ne nézzen bele se szabad szemmel, se optikai eszközökkel. Kerülje a sugárnyalábbal való érintkezést!

Aprendo l'unità vengono emesse radiazioni laser. Non fissare il fascio, non guardararlo direttamente con strumenti ottici e evitare l'esposizione diretta al fascio.

Открывая, берегитесь лазерного излучения.
Не смотрите на луч, не разглядывайте его
с помощью оптических инструментов, а также
избегайте прямого воздействия лазерного луча.

Ked je laserová jednotka otvorená. Vyhnite sa priamemu poľhadu a nehladte priamo s optickými nástrojmi do ľúča a vyhnite sa priamemu vystaveniu ľúčov.

開けるとレーザー光が放射されます。光線を見つめたり、光学機械を使って直接見たりしないでください。

Radiación láser al abrir. No mire fijamente ni examine con instrumental óptico el haz de luz. Evite la exposición directa al haz.

Important service information

This chapter presents the following important service information:

- “Strategy for replacing FRUs” on page 16
 - “Strategy for replacing a hard disk drive” on page 17
 - “Important notice for replacing a system board” on page 17
- “Important information about replacing RoHS compliant FRUs” on page 18

Important:

BIOS and device driver fixes are customer-installable. The BIOS and device drivers are posted on the customer support site:
<http://consumersupport.lenovo.com/>.

Strategy for replacing FRUs

Before replacing parts:

Make sure that all software fixes, drivers, and BIOS downloads are installed before replacing any FRUs listed in this manual.

After a system board is replaced, ensure that the latest BIOS is loaded to the system board before completing the service action.

To download software fixes, drivers, and BIOS, follow the steps below:

1. Go to <http://consumersupport.lenovo.com/>.
2. Enter a serial number or select a product or use Lenovo smart downloading.
3. Select the BIOS/Driver/Applications and download.
4. Follow the directions on the screen and install the necessary software.

Use the following strategy to prevent unnecessary expense for replacing and servicing FRUs:

- If you are instructed to replace an FRU, but the replacement does not solve the problem, reinstall the original FRU before you continue.
- Some computers have both a processor board and a system board. If you are instructed to replace either of them, and replacing one of them does not solve the problem, reinstall that board, and then replace the other one.
- If an adapter or a device consists of more than one FRU, any of the FRUs may be the cause of the error. Before replacing the adapter or device, remove the FRUs one by one to see if the symptoms change. Replace only the FRU that changed the symptoms.

Attention: The setup configuration on the computer you are servicing may have been customized. Running Automatic Configuration may alter the settings. Note the current configuration settings (using the View Configuration option); then, when service has been completed, verify that those settings remain in effect.

Strategy for replacing a hard disk drive

Always try to run a low-level format before replacing a hard disk drive. This will cause all customer data on the hard disk to be lost. Make sure that the customer has a current backup of the data before performing this action.

Attention: The drive startup sequence in the computer you are servicing may have been changed. Be extremely careful during write operations such as copying, saving, or formatting. If you select an incorrect drive, data or programs can be overwritten.

Important notice for replacing a system board

Some components mounted on a system board are very sensitive. Improper handling can cause damage to those components, and may cause a system malfunction.

Attention: When handling a system board:

- Do not drop the system board or apply any excessive force to it.
- Avoid rough handling of any kind.
- Avoid bending the system board and hard pushing to prevent cracking at each BGA (Ball Grid Array) chipset.

Important information about replacing RoHS compliant FRUs

RoHS, The Restriction of Hazardous Substances in Electrical and Electronic Equipment Directive (2002/95/EC) is a European Union legal requirement affecting the global electronics industry. RoHS requirements must be implemented on Lenovo products placed on the market after June 2006. Products on the market before June 2006 are not required to have RoHS compliant parts. If the original FRU parts are non-compliant, replacement parts can also be non-compliant. In all cases if the original FRU parts are RoHS compliant, the replacement part must also be RoHS compliant.

Note: RoHS and non-RoHS FRU part numbers with the same fit and function are identified with unique FRU part numbers.

Lenovo plans to transit to RoHS compliance well before the implementation date and expects its suppliers to be ready to support Lenovo's requirements and schedule in the EU. Products sold in 2005 and 2006 will contain some RoHS compliant FRUs. The following statement pertains to these products and any product Lenovo produces containing RoHS compliant FRUs.

RoHS compliant FRUs have unique FRU part numbers. Before or after the RoHS implementation date, failed RoHS compliant parts must always be replaced with RoHS compliant ones, so only the FRUs identified as compliant in the system HMM or direct substitutions for those FRUs may be used.

Products marketed before June 2006		Products marketed after June 2006	
Current or original part	Replacement FRU	Current or original part	Replacement FRU
Non-RoHS	Can be Non-RoHS		
Non-RoHS	Can be RoHS		
Non-RoHS	Can sub to RoHS	Must be RoHS	Must be RoHS
RoHS	Must be RoHS		

Note: A direct substitution is a part with a different FRU part number that is automatically shipped by the distribution center at the time of the order.

General checkout

This chapter presents the following information:

- “What to do first” on page 20
- “Power system checkout” on page 21

Before you go to the checkout, make sure to read the following important notes:

Important notes:

- **Only certified trained personnel can service the computer.**
- **Before replacing any FRU, read the entire page on removing and replacing FRUs.**
- **When you replace FRUs, use new nylon-coated screws.**
- **Be extremely careful during such write operations as copying, saving, or formatting.** Drives in the computer that you are servicing sequence might have been altered. If you select an incorrect drive, data or programs might be overwritten.
- **Replace an FRU only with another FRU of the correct model.** When you replace an FRU, make sure that the machine model and the FRU part number are correct by referring to the FRU parts list.
- **An FRU should not be replaced just because of a single, unreproducible failure.** Single failures can occur for a variety of reasons that have nothing to do with a hardware defect, such as cosmic radiation, electrostatic discharge, or software errors. Consider replacing an FRU only when a problem recurs. If you suspect that an FRU is defective, clear the error logs and run the test again. If the error does not recur, do not replace the FRU.
- **Be careful not to replace a nondefective FRU.**

What to do first

When you do return an FRU, you must include the following information in the parts exchange form or parts return form that you attach to it:

1. Name and phone number of servicer
2. Date of service
3. Date on which the machine failed
4. Date of purchase
5. Procedure index and page number in which the failing FRU was detected
6. Failing FRU name and part number
7. Machine type, model number, and serial number
8. Customer's name and address

Note for warranty: During the warranty period, the customer may be responsible for repair costs if the computer damage was caused by misuse, accident, modification, unsuitable physical or operating environment, or improper maintenance by the customer.

The following is a list of some common items that are not covered under warranty and some symptoms that might indicate that the system was subjected to stress beyond normal use.

Before checking problems with the computer, determine whether the damage is covered under the warranty by referring to the following list:

The following are not covered under warranty:

- LCD panel cracked from the application of excessive force or from being dropped
- Scratched (cosmetic) parts
- Distortion, deformation, or discoloration of the cosmetic parts
- Plastic parts, latches, pins, or connectors that have been cracked or broken by excessive force
- Damage caused by liquid spilled into the system
- Damage caused by the improper insertion of a PC Card or the installation of an incompatible card
- Improper disk insertion or use of an optical drive
- Diskette drive damage caused by pressure on the diskette drive cover, foreign material in the drive, or the insertion of a diskette with multiple labels
- Damaged or bent diskette eject button
- Fuses blown by attachment of a nonsupported device
- Forgotten computer password (making the computer unusable)
- Sticky keys caused by spilling a liquid onto the keyboard
- Use of an incorrect AC adapter on laptop products

The following symptoms might indicate damage caused by nonwarranted activities:

- Missing parts might be a symptom of unauthorized service or modification.
- If the spindle of a hard disk drive becomes noisy, it may have been subjected to excessive force, or dropped.

Power system checkout

To verify a symptom, follow the steps below:

1. Turn off the computer.
2. Remove the battery pack.
3. Connect the AC adapter.
4. Make sure that power is supplied when you turn on the computer.
5. Turn off the computer.
6. Disconnect the AC adapter and install the charged battery pack.
7. Make sure that the battery pack supplies power when you turn on the computer.

If you suspect a power problem, see the appropriate one of the following power supply checkouts:

- “Checking the AC adapter” on page 21
- “Checking operational charging” on page 21
- “Checking the battery pack” on page 22

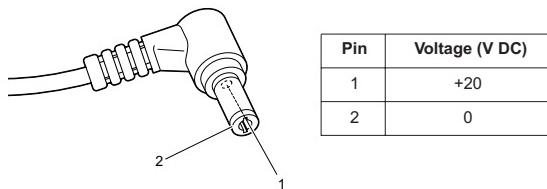
Checking the AC adapter

You are here because the computer fails only when the AC adapter is used.

- If the power-on indicator does not turn on, check the power cord of the AC adapter for correct continuity and installation.
- If the computer does not charge during operation, go to “Checking operational charging”.

To check the AC adapter, follow the steps below:

1. Unplug the AC adapter cable from the computer.
2. Measure the output voltage at the plug of the AC adapter cable. See the following figure:



Note: Output voltage for the AC adapter pin No. 2 may differ from the one you are servicing.

3. If the voltage is not correct, replace the AC adapter.
4. If the voltage is acceptable, do the following:
 - Replace the system board.
 - If the problem continues, go to “Lenovo G460e/G560e” on page 27.

Note: Noise from the AC adapter does not always indicate a defect.

Checking operational charging

To check whether the battery charges properly during operation, use a discharged battery pack or a battery pack that has less than 50% of the total power remaining when installed in the computer.

Perform operational charging. If the battery status indicator or icon does not light on, remove the battery pack and let it return to room temperature. Reinstall the battery pack. If the charge indicator or icon is still off, replace the battery pack.

If the charge indicator still does not light on, replace the system board. Then reinstall the battery pack. If it is still not charged, go to the next section.

Checking the battery pack

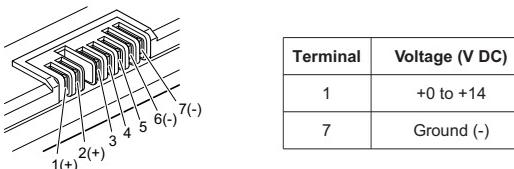
Battery charging does not start until the Power Meter shows that less than 95% of the total power remains; under this condition the battery pack can charge to 100% of its capacity. This protects the battery pack from being overcharged or from having a shortened life.

To check your battery, move your cursor to the Power Meter icon in the icon tray of the Windows® taskbar and wait for a moment (but do not click it), and the percentage of battery power remaining is displayed. To get detailed information about the battery, double-click the Power Meter icon.

Note: If the battery pack becomes hot, it may not be able to be charged. Remove it from the computer and leave it at room temperature for a while. After it cools down, reinstall and recharge it.

To check the battery pack, follow the steps below:

1. Turn off the computer.
2. Remove the battery pack and measure the voltage between battery terminals 1 (+) and 7 (-). See the following figure:



3. If the voltage is less than +11.0 V DC, the battery pack has been discharged.

Note: Recharging will be continued for at least 3 hours, even though the indicator does not light on.

If the voltage is still less than +11.0 V DC after recharging, replace the battery.

4. If the voltage is more than +11.0 V DC, measure the resistance between battery terminals 5 and 7. The resistance must be 4 to 30 KΩ.

If the resistance is not correct, replace the battery pack. If the resistance is correct, replace the system board.

Related service information

This chapter presents the following information:

- “Restoring the factory contents by using OneKey Recovery” on page 23
- “Passwords” on page 24
- “Power management” on page 25

Restoring the factory contents by using OneKey Recovery

Restore of factory default

The Lenovo G460e/G560e computers come with pre-installed OneKey Rescue System. In order to save application files and the initial backed up files of the system, the hard disk in a Lenovo computer includes a hidden partition when it is shipped. If you need to restore the system to the point of your first boot up, just enter Lenovo OneKey Rescue System and run **Restore to factory default**. For details of OneKey Rescue System, see *the User Guide for OneKey Rescue System*.

Note: This will delete all the new data on the system partition (C drive), which is not recoverable. Make sure to back up your critical data before you perform this action.

Using recovery discs

When you replace a hard disk drive in your computer, you are unable to use the pre-installed Lenovo OneKey Recovery and OneKey Rescue. However, you can use the recovery discs that store your backed up data to restore your new hard drive to a previous backup status.

Note: You can create recovery discs by burning the backup image to a CD/DVD as recovery discs. For details of **Create recovery discs**, see *the User Guide for OneKey Rescue System*.

When you use the recovery discs to boot your computer, the system will enter the user interface for system recovery automatically. Please follow the prompt to insert the backup discs to complete the whole recovery process.

Note: The recovery process might take up to 2 hours.

Passwords

As many as two passwords may be needed for any Lenovo computer: the power-on password (POP) and the supervisor password (SVP).

If any of these passwords has been set, a prompt for it appears on the screen whenever the computer is turned on. The computer does not start until the password is entered.

Exception: If only an SVP is installed, the password prompt does not appear when the operating system is booted.

Power-on password

A power-on password (POP) protects the system from being powered on by an unauthorized person. The password must be entered before an operating system can be booted.

Supervisor password

A supervisor password (SVP) protects the system information stored in the BIOS Setup Utility. The user must enter the SVP in order to get access to the BIOS Setup Utility and change the system configuration.

Attention: If the SVP has been forgotten and cannot be made available to the servicer, there is no service procedure to reset the password. The system board must be replaced for a scheduled fee.

Power management

Note: Power management modes are not supported for APM operating system.

To reduce power consumption, the computer has three power management modes: screen blank, sleep (standby), and hibernation.

Screen blank mode

If the time set on the "Turn off monitor" timer in the operating system expires, the LCD backlight turns off. You can also turn off the LCD backlight by pressing Fn+F2.

To end screen blank mode and resume normal operation, press any key.

Sleep (standby) mode

When the computer enters sleep (standby) mode, the following events occur in addition to what occurs in screen blank mode:

- The LCD is powered off.
- The hard disk drive is powered off.
- The CPU stops.

To enter sleep (standby) mode, press Fn+F1.

In certain circumstances, the computer goes into sleep (standby) mode automatically:

- If a "suspend time" has been set on the timer, and the user does not do any operation with the keyboard, the hard disk, the parallel connector, or the diskette drive within that time.
- If the battery indicator is amber, indicating that the battery power is low. (Alternatively, if **Hibernate when battery becomes low** has been selected in the "Power Management Properties" window, the computer goes into hibernation mode.)

To cause the computer to return from sleep (standby) mode and resume the operation, do one of the following:

- Press the Fn key.
- Open the lid.
- Turn on the power switch.

Also, in the following event, the computer automatically returns from sleep (standby) mode and resumes the operation:

- The time set on the resume timer elapses.

Note: The computer does not accept any input immediately after it enters sleep (standby) mode. Wait a few seconds before taking any action to reenter operation mode.

Hibernation mode

In hibernation mode, the following occurs:

- The system status, RAM, VRAM, and setup data are stored on the hard disk.
- The system is powered off.

To cause the computer to enter hibernation mode, follow the steps below:

- If you are using the ACPI operating system and have defined one of the following actions as the event that causes the system to go into hibernation mode, perform that action:
 - Closing the lid.
 - Pressing the power button.

Also, the computer goes into hibernation mode automatically in either of the following conditions:

- If a “hibernation time” has been set on the timer, and if the user does not do any operation with the keyboard, the hard disk drive, the parallel connector, or the diskette drive within that time.
- If the timer conditions are satisfied in suspend mode.

When the power is turned on, the computer returns from hibernation mode and resumes operation. The hibernation file in the boot record on the hard disk drive is read, and system status is restored from the hard disk drive.

Lenovo G460e/G560e

This chapter presents the following product-specific service references and product-specific parts information:

- “Specifications” on page 27
- “Status indicators” on page 29
- “FRU tests” on page 31
- “Fn key combinations” on page 31
- “FRU replacement notices” on page 32
- “Removing and replacing an FRU” on page 33
- “Locations” on page 72
- “Parts list” on page 75

Specifications

The following table lists the specifications of the Lenovo G460e/G560e:

Table 1. Specifications

Feature	Description
Processor	<ul style="list-style-type: none"> • Intel Montevina
Core Chipset	<ul style="list-style-type: none"> • Intel GM45
Bus architecture	<ul style="list-style-type: none"> • DDR3: 800, 1066MT/s for Dual Core CPU • DDR3: 800, 1066, 1333MT/s for Quad Core CPU • DMI × 4, 2.5Gb/s • FDI 8 lanes (2channels), 2.7Gt/s • PCI Express
Graphic Chipset	<ul style="list-style-type: none"> • Intel integrated
Display	<ul style="list-style-type: none"> • 14.0 HD LED Panel, Wedge type, 1366×768 pixels, 220 nit (G460e) • 15.6 HD LED Panel, Wedge type, 1366×768 pixels, 220 nit (G560e)
Standard memory	<ul style="list-style-type: none"> • DDR3 1066 SODIMM (x2), Support Dual Channel
CMOS RAM	<ul style="list-style-type: none"> • 256 bytes
Hard disk drive	<ul style="list-style-type: none"> • 2.5" SATA 250/320/500GB (5400rpm) • 2.5" SATA 320/500/750GB (7200rpm)
Optical drive	<ul style="list-style-type: none"> • 12.7mm Tray RAMBO

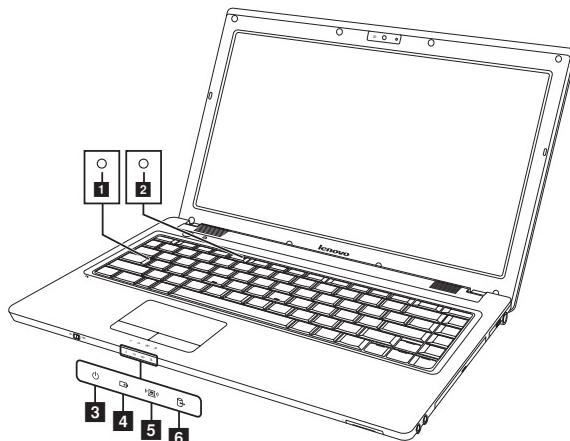
Table 1. Specifications (continued)

Feature	Description
I/O port	<ul style="list-style-type: none"> • External monitor connector • Stereo headphone jack • Microphone jack • RJ45 × 1 • USB 2.0 × 3 • 5-in-1 card reader
MODEM slot	<ul style="list-style-type: none"> • N/A
Audio	<ul style="list-style-type: none"> • 1/8" Stereo Headphone Output Jack • 1/8" Input Jack Microphone • Built-in stereo speakers • Built-in microphone
Video	<ul style="list-style-type: none"> • CRT port × 1
Ethernet (on the system board)	<ul style="list-style-type: none"> • 10/100 Ethernet
PCI Express Mini Card slot	<ul style="list-style-type: none"> • 1 slot for WLAN card (half size)
WLAN	<ul style="list-style-type: none"> • Intel 802.11 a/b/g/n & WiMax combo • Broadcom/Atheros b/g/n
WWAN	<ul style="list-style-type: none"> • design ready
Bluetooth wireless	<ul style="list-style-type: none"> • BT2.1 + EDR CyberTan/USI module
Keyboard	<ul style="list-style-type: none"> • Numeric Keyboard
Touch pad	<ul style="list-style-type: none"> • Two clicks with Dome
Integrated camera	<ul style="list-style-type: none"> • 0.3M pixies
Battery	<ul style="list-style-type: none"> • 48WH, 6 cell Li-Cylinder Battery
AC adapter	<ul style="list-style-type: none"> • 65 W
Pre-installed operating system	<ul style="list-style-type: none"> • Win 7 Starter/Home Basic/Premium/Professional • Free DOS

Status indicators

The system status indicators below show the computer status:

G460e:



G560e:

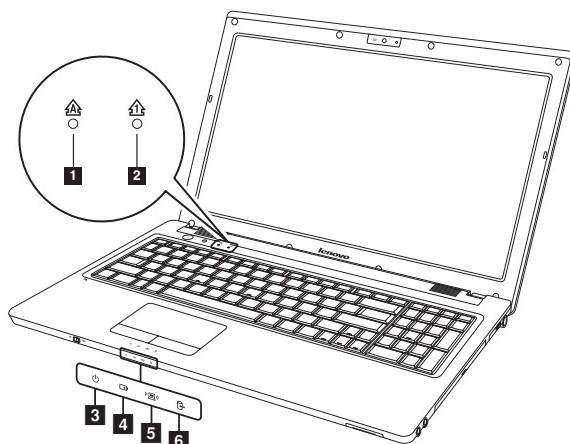


Table 2. Status indicators

Indicator	Meaning
1 Caps lock (G460e): • (G560e): 	White: Caps Lock mode is enabled. You can enter all alphabetic characters (A-Z) in uppercase without pressing the Shift key. To enable or disable Caps Lock mode, press the CapsLk key.
2 Num lock (G460e): • (G560e): 	White: The separate numeric keypad on the keyboard is enabled. To enable or disable the numeric keypad, press the Num Lock key.
3 Power on 	White: System is enabled. Blinking white: System is in sleep mode. off: System is in hibernate mode or shut down.
4 Battery status 	Blinking amber: (500ms off/1s on) The remaining power of the battery is less than 5% of its capacity. Blinking amber: (100ms off/3.2s on) The battery is being charged with the remaining power between 5% and 20% of its capacity. Amber: The computer is operating on battery power with the remaining power between 5% and 20% of its capacity. Blinking white: The battery is being charged with the remaining power between 20% and 80% of its capacity. White: The remaining power of the battery is more than 80% of its capacity, or the computer is operating on battery power with the remaining power between 20% and 80% of its capacity.
5 Wireless status 	White: The wireless LAN radio is turned on and connected to AP. Blinking white: The wireless LAN is switched on and the radio of it is also turned off, or the wireless LAN radio is turned on and not connected to AP. Flashing white: The wireless LAN radio is turned on and data is being transmitted. Off: The wireless LAN is switched off and the radio of it is also turned off.
6 Drive in use 	White: Data is being read from or written to the hard disk drive, or the optical disk drive. When this indicator is on, do not put the computer into standby mode or turn off the computer. Note: Do not move the system while the white drive-in-use light is on. Sudden physical shock could cause drive errors.

Fn key combinations

The following table shows the function of each combination of Fn with a function key.

Table 4. Fn key combinations

Key combination	Description
Fn + Esc:	Turn on/off the integrated camera.
Fn + F1:	Enter sleep mode.
Fn + F2:	Turn on/off the backlight of the LCD screen.
Fn + F3:	Open the interface for the display device switch to select this notebook or an external display.
Fn + F4:	Open the interface for display resolution settings.
Fn + F5:	Open the interface for integrated wireless devices settings (On/Off).
Fn + F6:	Enable/Disable the touchpad.
Fn + F8 (G460e):	Enable/Disable the numeric keypad.
Fn + F9:	Start/Pause playback of Windows Media Player.
Fn + F10:	Stop playback of Windows Media Player.
Fn + F11:	Skip to the previous track.
Fn + F12:	Skip to the next track.
Fn + Insert (G560e):	Enable/Disable the scroll lock.
Fn + PgUp (G460e):	
Fn + PrtSc:	Activate the system request.
Fn + Home:	Activate the pause function.
Fn + End:	Activate the break function.
Fn + PgDn (G460e):	Activate the insert function.
Fn + ↑/↓:	Increase/Decrease display brightness.
Fn + ↗/↖:	Increase/Decrease sound volume.

FRU replacement notices

This section presents notices related to removing and replacing parts. Read this section carefully before replacing any FRU.

Screw notices

Loose screws can cause a reliability problem. In the Lenovo computer, this problem is addressed with special nylon-coated screws that have the following characteristics:

- They maintain tight connections.
- They do not easily come loose, even with shock or vibration.
- They are harder to tighten.
- Each one should be used only once.

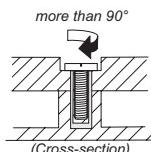
Do the following when you service this machine:

- Keep the screw kit in your tool bag.
- Always use new screws.
- Use a torque screwdriver if you have one.

Tighten screws as follows:

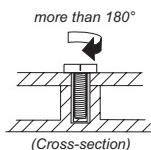
- **Plastic to plastic**

Turn an additional 90° after the screw head touches the surface of the plastic part:



- **Logic card to plastic**

Turn an additional 180° after the screw head touches the surface of the logic card:



- **Torque driver**

If you have a torque screwdriver, refer to the "Torque" column for each step.

- Make sure that you use the correct screws. If you have a torque screwdriver, tighten all screws firmly to the torque shown in the table. **Never use a screw that you removed. Use a new one. Make sure that all screws are tightened firmly.**
- Ensure torque screwdrivers are calibrated correctly following country specifications.

Removing and replacing an FRU

This section presents exploded figures with the instructions to indicate how to remove and replace the FRU. Make sure to observe the following general rules:

1. Do not attempt to service any computer unless you have been trained and certified. An untrained person runs the risk of damaging parts.
2. Before replacing any FRU, review “FRU replacement notices” on page 32.
3. Begin by removing any FRUs that have to be removed before the failing FRU. Any of such FRUs are listed at the top of the page. Remove them in the order in which they are listed.
4. Follow the correct sequence in the steps to remove the FRU, as given in the figures by the numbers in square callouts.
5. When turning a screw to replace an FRU, turn it in the direction as given by the arrow in the figure.
6. When removing the FRU, move it in the direction as given by the arrow in the figure.
7. To put the new FRU in place, reverse the removal procedures and follow any of the notes that pertain to replacement. For information about connecting and arranging internal cables, see “Locations” on page 72.
8. When replacing an FRU, use the correct screw as shown in the procedures.

 **DANGER**

Before removing any FRU, turn off the computer, unplug all power cords from electrical outlets, remove the battery pack, and then disconnect any of the interconnecting cables.

Attention: After replacing an FRU, do not turn on the computer until you have made sure that all screws, springs, and other small parts are in place and none are loose inside the computer. Verify this by shaking the computer gently and listening for rattling sounds. Metallic parts or metal flakes can cause electrical short circuits.

Attention: The system board is sensitive to, and can be damaged by, electrostatic discharge. Before touching it, establish personal grounding by touching a ground point with one hand or using an electrostatic discharge (ESD) strap (P/N 6405959) to remove potential shock reasons.

Note: The illustrations used in this section are of the Lenovo G560e, unless otherwise stated.

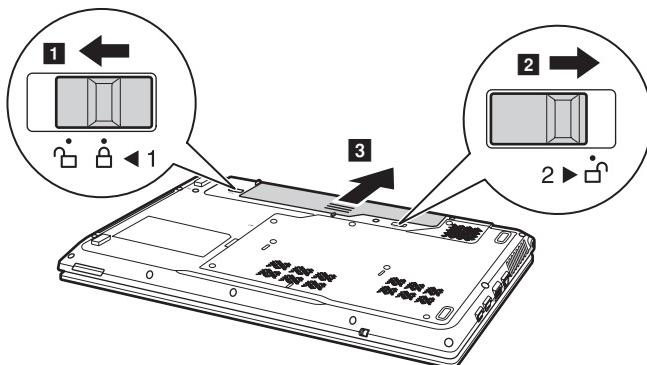
1010 Battery pack

DANGER

Only use the battery specified in the parts list for your computer. Any other battery could ignite or explode.

Figure 1. Removal steps of battery pack

Unlock the manual battery latch **1**. Holding the spring-loaded battery latch in the unlocked position **2**, remove the battery pack in the direction shown by the arrow **3**.



When installing: Install the battery pack along the slide rails of the slot. Then make sure that the battery release lever is in the locked position.

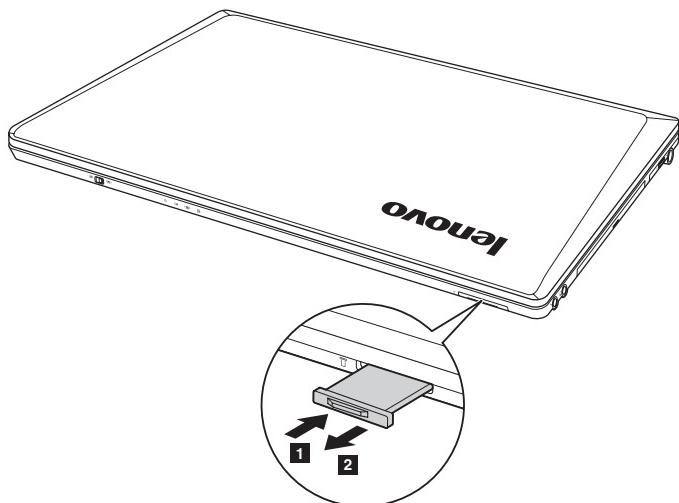
1020 Dummy card

For access, remove this FRU:

- “1010 Battery pack” on page 34

Figure 2. Removal steps of dummy cards

Remove the dummy card in the direction shown by arrows **1** **2**.



1030 Hard disk drive(HDD)/Memory/Mini PCI Express Card slot compartment cover

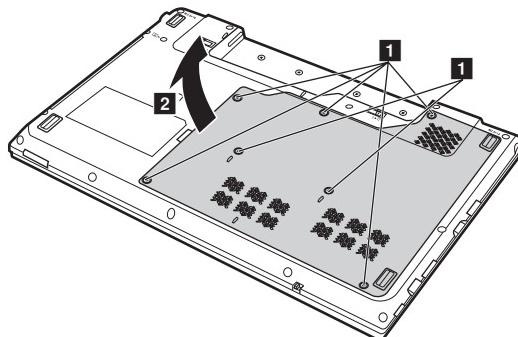
For access, remove this FRU:

- “1010 Battery pack” on page 34

Figure 3. Removal steps of HDD/Memory/Mini PCI Express Card slot compartment cover

G460e: Loosen five screws **1** that secure the compartment cover. Remove the compartment cover **2**.

G560e: Loosen seven screws **1** that secure the compartment cover. Remove the compartment cover **2**.



Step	Screw (quantity)	Color	Torque
1	G460: M2.5 × 4 mm, flat-head, nylok-coated (5) G560: M2.5 × 4 mm, flat-head, nylok-coated (5) M2.45 × 8 mm, flat-head, nylok-coated (2)	Black	2.0 ~ 2.5 kgfcm

1040 Hard disk drive

For access, remove these FRUs in order:

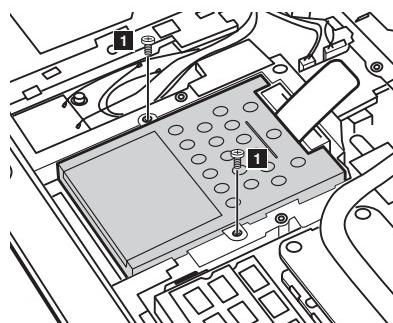
- “1010 Battery pack” on page 34
- “1030 Hard disk drive(HDD)/Memory/Mini PCI Express Card slot compartment cover” on page 36

Attention:

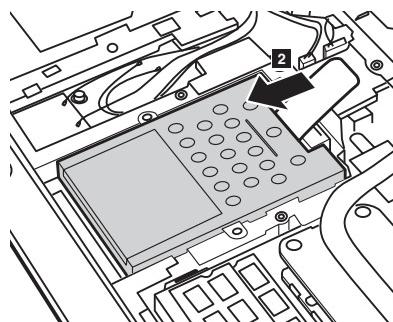
- **Do not drop the hard disk drive or apply any physical shock to it.**
The hard disk drive is sensitive to physical shock. Improper handling can cause damages and permanent loss of data.
- Before removing the drive, suggest the customer to backup all the information on it if possible.
- Never remove the drive while the system is operating or is in suspend mode.

Figure 4. Removal steps of hard disk drive

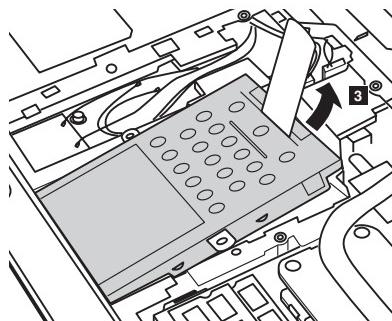
Remove the frame fixing screws **1**.



Pull the tab in the direction shown by arrow **2**.



Take out the hard disk drive secured in a metal frame **3**.



Step	Screw (quantity)	Color	Torque
1	M2.5 × 4 mm, flat-head, nylok-coated (2)	Black	2.0 ~ 2.5 kgfcm

When installing: Make sure that the HDD connector is attached firmly.

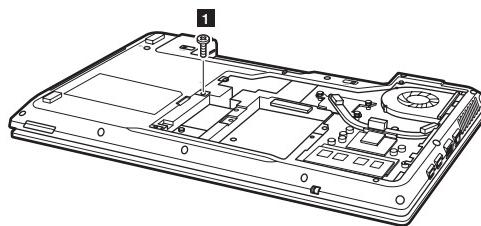
1050 Optical drive

For access, remove this FRU:

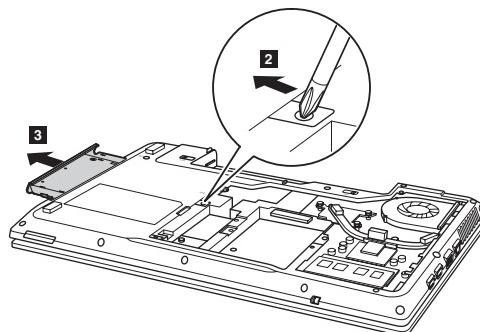
- “1010 Battery pack” on page 34

Figure 4. Removal steps of optical drive

Remove the screw **1**, insert a screwdriver into the screw hole and push the optical drive in the direction shown by arrow **2**. Pull the optical drive out in the direction shown by arrow **3**.



Step	Screw (quantity)	Color	Torque
1	G460e: M2.5 × 10 mm, flat-head, nylok-coated (1) G560e: M2.5 × 4 mm, flat-head, nylok-coated (1)	Black	2.0 ~ 2.5 kgfcm



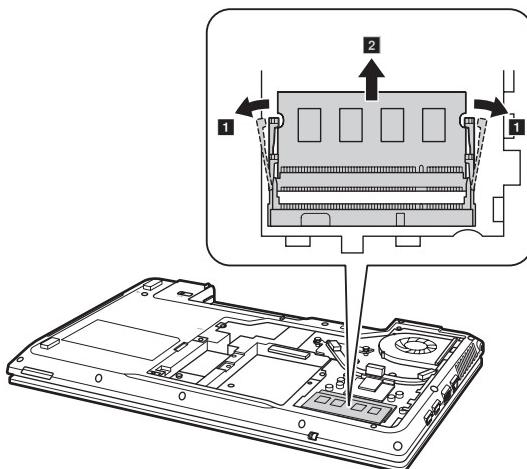
1060 DIMM

For access, remove these FRUs in order:

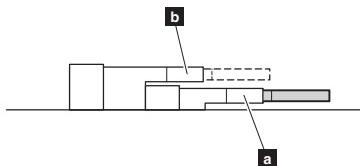
- “1010 Battery pack” on page 34
- “1030 Hard disk drive(HDD)/Memory/Mini PCI Express Card slot compartment cover” on page 36

Figure 6. Removal steps of DIMM

Release the two latches on both edges of the socket at the same time in the direction shown by arrows **1**, and then unplug the DIMM in the direction shown by arrow **2**.



Note: If only one DIMM is used on the computer you are servicing, the card must be installed in SLOT-0 (**a** : lower slot), but not in SLOT-1 (**b** : upper slot).



When installing: Insert the notched end of the DIMM into the socket. Push the DIMM firmly, and pivot it until it snaps into the place. Make sure that it is firmly fixed in the slot and difficult to be moved.

1070 PCI Express Mini Card for wireless LAN/WAN

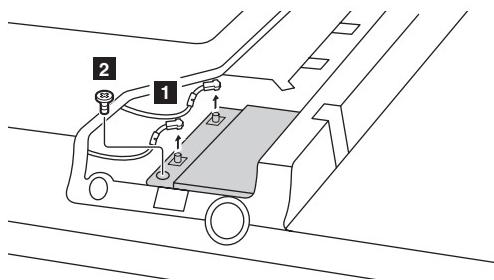
For access, remove these FRUs in order:

- “1010 Battery pack” on page 34
- “1030 Hard disk drive(HDD)/Memory/Mini PCI Express Card slot compartment cover” on page 36

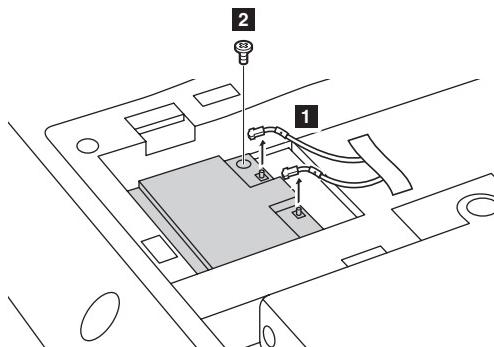
Figure 7. Removal steps of PCI Express Mini Card for wireless LAN/WAN

Disconnect the two wireless LAN cables (black, white) **1**, and then remove the screw **2**.

G460e:



G560e:



In step **1**, unplug the jacks by using the removal tool antenna RF connector (P/N: 08K7159), or pick up the connectors with your fingers and gently unplug them in the direction shown by arrows.

Notes: wireless LAN card has 2 cables in step **1**.

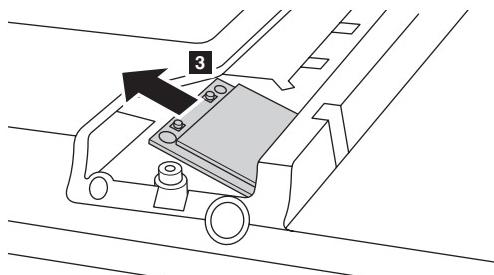
Wireless LAN card in some models may have 3 cables in step **1**.

Step	Screw (quantity)	Color	Torque
2	M2 × 3 mm, flat-head, nylok-coated (1)	Black	1.5 ~ 2.0 kgfcm

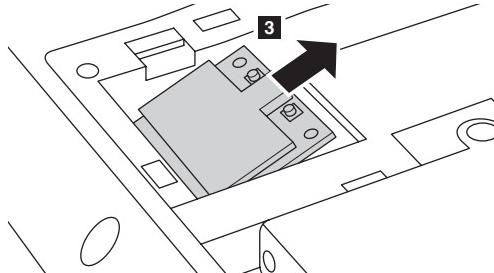
Figure 7. Removal steps of PCI Express Mini Card for wireless LAN/WAN (continued)

Remove the card in the direction shown by arrow **3**.

G460e:



G560e:



When installing:

- In models with a wireless LAN card that has two antenna connectors, plug the black cable (1st) (MAIN) into the jack labeled **1**, and the white cable (2nd) (AUX) into jack labeled **2** on the card.
- In models with a wireless LAN card that has three antenna connectors, plug the black cable (1st) (MAIN) into the jack labeled **1**, the grey cable (3rd) into jack labeled **3**, and the white cable (2nd) (AUX) into jack labeled **2** on the card.

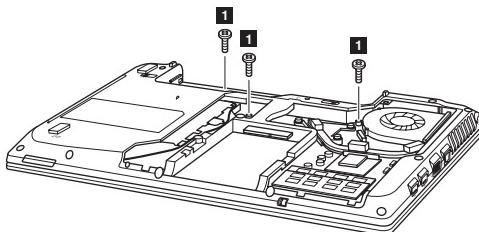
1080 Keyboard

For access, remove this FRU:
 • “1010 Battery pack” on page 34

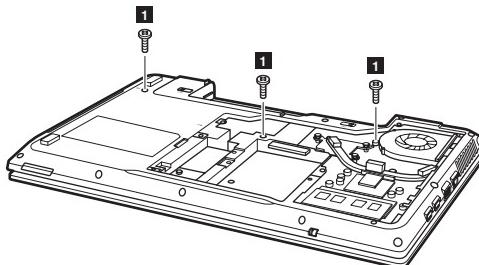
Figure 8. Removal steps of keyboard

Remove three screws **1**.

G460e:



G560e:



Step	Screw (quantity)	Color	Torque
1	G460e: M2.5 × 4 mm, flat-head, nylok-coated (3) G560e: M2 × 3 mm, flat-head, nylok-coated (1) M2.45 × 8 mm, flat-head, nylok-coated (2)	Black	1.5 ~ 2.0 kgfcm 2.0 ~ 2.5 kgfcm

Figure 8. Removal steps of keyboard (continued)

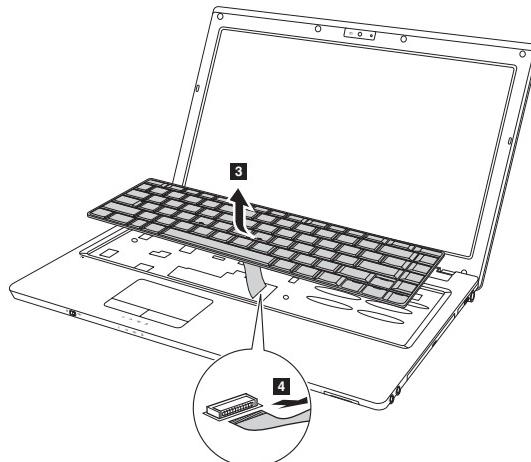
Loosen the keyboard with fingers in the direction shown by arrows **2**.



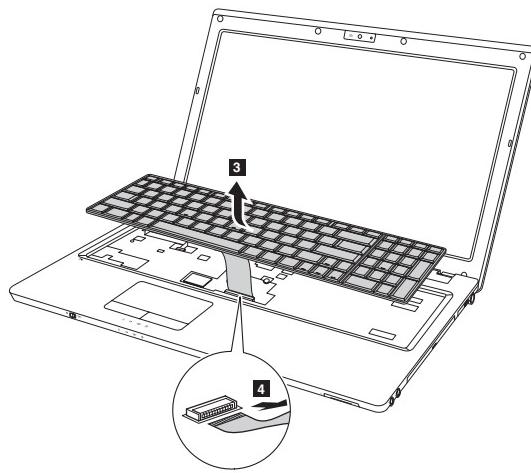
Figure 8. Removal steps of keyboard (continued)

Lift the keyboard a little **3**, and then detach the connector in the direction shown by arrow **4**.

G460e:



G560e:



When installing: Make sure that the FPC connector is attached firmly.

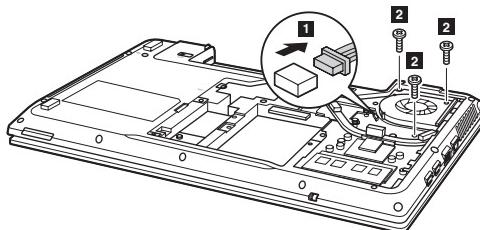
1090 Fan assembly and Heat Sink assembly

For access, remove these FRUs in order:

- “1010 Battery pack” on page 34
- “1020 Dummy card” on page 35
- “1030 Hard disk drive(HDD)/Memory/Mini PCI Express Card slot compartment cover” on page 36
- “1040 Hard disk drive” on page 37
- “1050 Optical drive” on page 39
- “1060 DIMM” on page 40
- “1070 PCI Express Mini Card for wireless LAN/WAN” on page 41
- “1080 Keyboard” on page 43
- “1100 Keyboard bezel” on page 48
- “1110 System board” on page 53

Figure 9. Removal steps of fan assembly and heat sink assembly

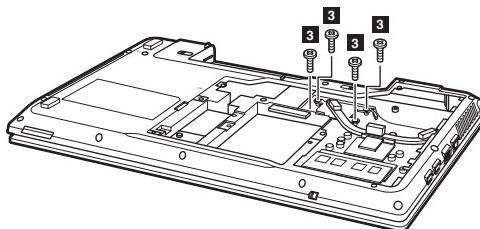
Detach the fan connector in the direction shown by arrow **1** and loosen three screws **2** to lift the fan assembly.



When installing: Make sure that the fan connector is attached firmly to the system board.

Step	Screw (quantity)	Color	Torque
1	M2.5 × 4 mm, flat-head, nylok-coated (3)	Black	1.5 ~ 2.0 kgfcm

Figure 9. Removal steps of fan assembly and heat sink assembly (continued)
Loosen four screws **3** to lift the heat sink assembly.



Step	Screw (quantity)	Color	Torque
3	M2.5 × 3.2 mm, flat-head, nylok-coated (4)	White	2.0 ~ 2.5 kgfcm

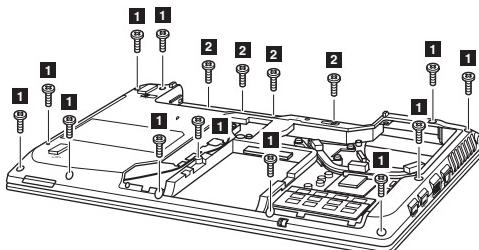
1100 Keyboard bezel

For access, remove these FRUs in order:

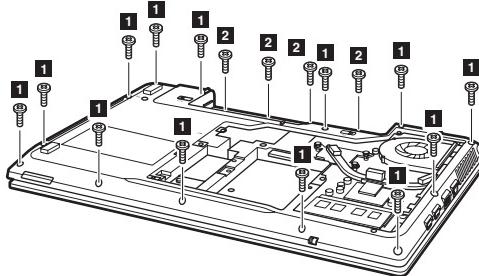
- “1010 Battery pack” on page 34
- “1030 Hard disk drive(HDD)/Memory/Mini PCI Express Card slot compartment cover” on page 36
- “1050 Optical drive” on page 39
- “1080 Keyboard” on page 43

Figure 10. Removal steps of keyboard bezel

G460e: Remove twelve screws **1**, four screws **2** on the bottom.



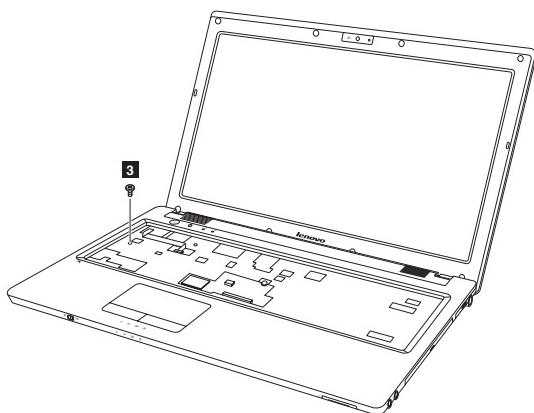
G560e: Remove thirteen screws **1**, four screws **2** on the bottom.



Step	Screw (quantity)	Color	Torque
1	G460e: M2.45 × 8 mm, flat-head, nylok-coated (12) G460e: M2.45 × 8 mm, flat-head, nylok-coated (13)	Black	2.0 ~ 2.5 kgfcm
2	M2 × 2 mm, flat-head, nylok-coated (4)	Black	1.5 ~ 2.0 kgfcm

Figure 10. Removal steps of keyboard bezel (continued)

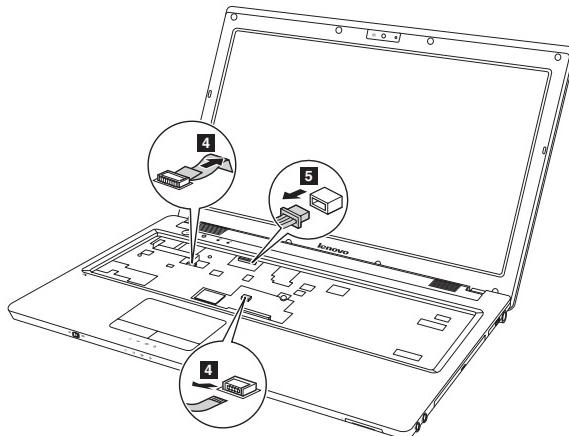
Remove the screw **3**.



Step	Screw (quantity)	Color	Torque
3	M2.5 × 4 mm, flat-head, nylok-coated (1)	Black	1.5 ~ 2.0 kgfcm

Figure 10. Removal steps of keyboard bezel (continued)

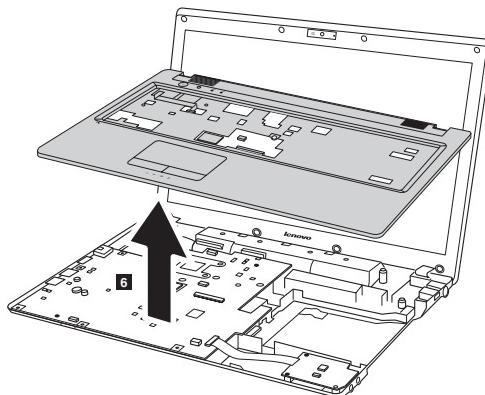
Detach two FPC connectors in the direction shown by arrow **4**. Unplug the microphone connector in the direction shown by arrow **5**.



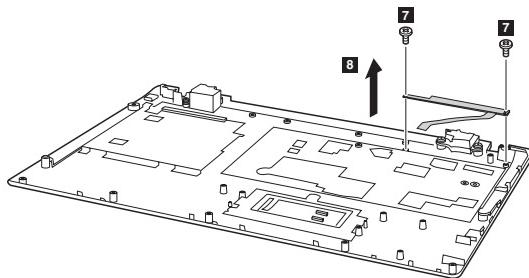
When installing: Make sure that all the FPC connectors, microphone connectors and LCD connector are attached firmly.

Figure 10. Removal steps of keyboard bezel (continued)

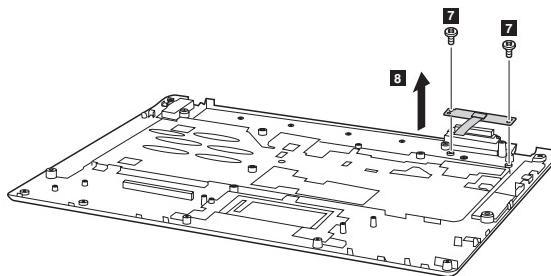
Remove the keyboard bezel in the direction shown by arrow **6**.



Remove two screws **7**, and then remove the power board **8**.
G460e:

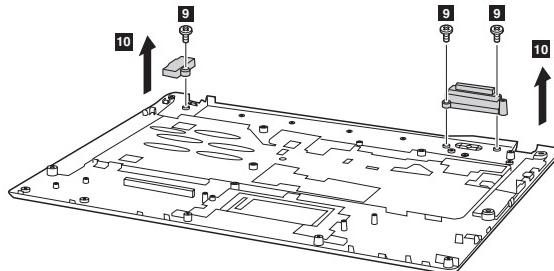


G560e:

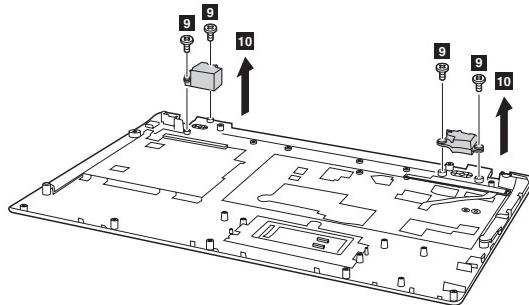


Step	Screw (quantity)	Color	Torque
7	G460e: M2 × 2.5 mm, flat-head, nylok-coated (2) G560e: M2 × 3 mm, flat-head, nylok-coated (2)	Black	1.5 ~ 2.0 kgfcm

G460e: Remove three screws **9**, and then remove the speakers **10**.



G560e: Remove four screws **9**, and then remove the speakers **10**.



Step	Screw (quantity)	Color	Torque
9	G460e: M2.5× 5.7 mm, flat-head, nylok-coated (3) G560e: M2.5 × 5.7 mm, flat-head, nylok-coated (4)	Black	2.0 ~ 2.5 kgfcm

1110 System board

Important notices for handling the system board:

When handling the system board, bear the following in mind.

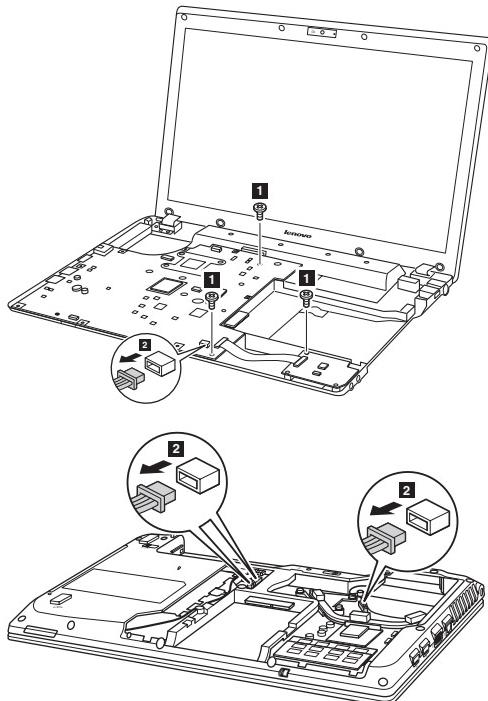
- Be careful not to drop the system board on a bench top that has a hard surface, such as metal, wood, or composite.
- Avoid rough handling of any kind.
- In the whole process, make sure not to drop or stack the system board.
- If you put a system board down, make sure to put it only on a padded surface such as an ESD mat or conductive corrugated material.

For access, remove these FRUs in order:

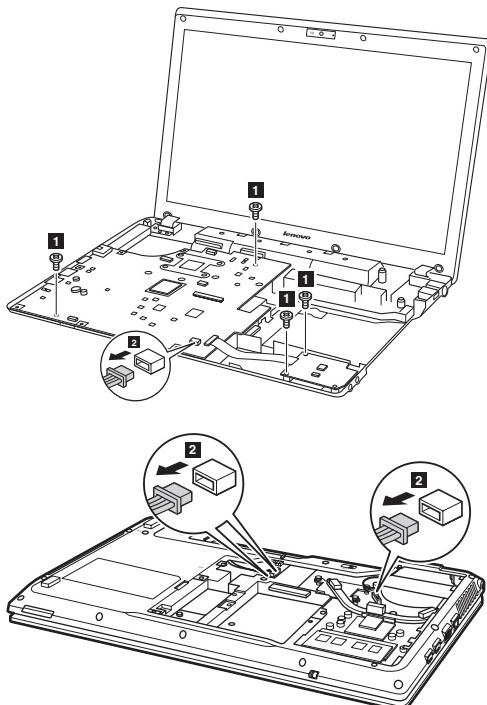
- “1010 Battery pack” on page 34
- “1020 Dummy card” on page 35
- “1030 Hard disk drive(HDD)/Memory/Mini PCI Express Card slot compartment cover” on page 36
- “1040 Hard disk drive” on page 37
- “1050 Optical drive” on page 39
- “1060 DIMM” on page 40
- “1070 PCI Express Mini Card for wireless LAN/WAN” on page 41
- “1080 Keyboard” on page 43
- “1100 Keyboard bezel” on page 48

Figure 11. Removal steps of system board

G460e: Remove three screws **1**. Unplug four microphone connectors in the direction shown by arrows **2**.



G560e: Remove four screws **1**. Unplug four microphone connectors in the direction shown by arrows **2**.

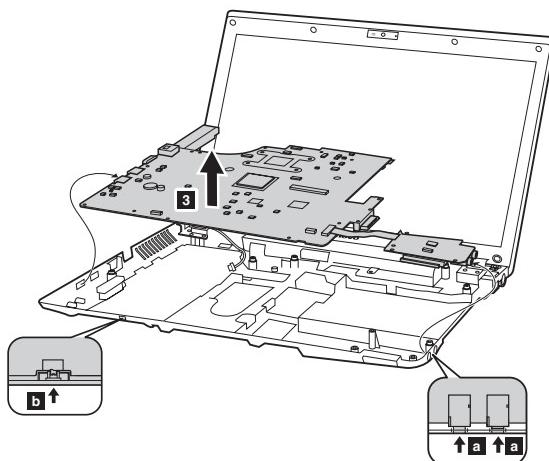


When installing: Make sure that all the connectors are attached firmly.

Step	Screw (quantity)	Color	Torque
1	G460e: M2.5 × 4 mm, flat-head, nylok-coated (3) G460e: M2.5 × 4 mm, flat-head, nylok-coated (4)	Black	2.0 ~ 2.5 kgfcm

Figure 11. Removal steps of system board (continued)

Remove the system board in the direction shown by arrow **3**.



When installing: When attaching the system board to the base cover, adjust the placement of the wireless radio switch as shown in **b**, and make sure that both of the audio jack and the microphone jack are attached to the holes on the base cover as shown in **a**. Improper placement of the switch or those jacks might cause a damage.

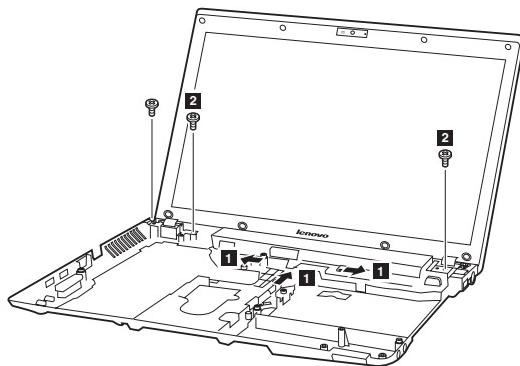
1120 LCD unit

For access, remove these FRUs in order:

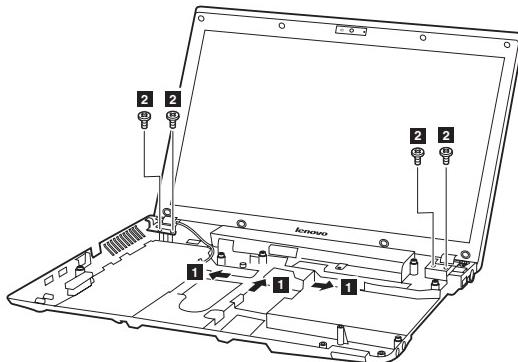
- “1010 Battery pack” on page 34
- “1020 Dummy card” on page 35
- “1030 Hard disk drive(HDD)/Memory/Mini PCI Express Card slot compartment cover” on page 36
- “1040 Hard disk drive” on page 37
- “1050 Optical drive” on page 39
- “1060 DIMM” on page 40
- “1070 PCI Express Mini Card for wireless LAN/WAN” on page 41
- “1080 Keyboard” on page 43
- “1100 Keyboard bezel” on page 48
- “1110 System board” on page 53

Figure 12. Removal steps of LCD unit

G460e: Release the antenna cables from the cable guides in the direction shown by arrows **1**. Remove three screws **2**.



G560e: Release the antenna cables from the cable guides in the direction shown by arrows **1**. Remove four screws **2**.



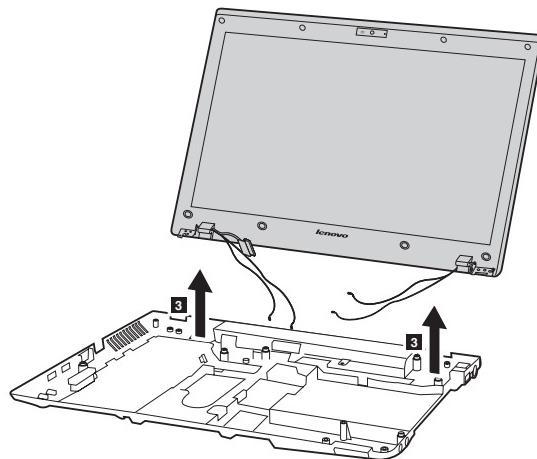
Step	Screw (quantity)	Color	Torque
2	G460e: M2.5 × 6 mm, flat-head, nylok-coated (3) G560e: M2.5 × 4 mm, flat-head, nylok-coated (4)	Black	2.0 ~ 2.5 kgfcm

When installing:

- Route the antenna cables along the cable guides. As you route the cables, make sure that they are not subjected to any tension. Tension could cause the cables to be damaged by the cable guides, or a wire to be broken.
- Make sure that the LCD connector is attached firmly and make sure that you do not pinch the antenna cables when you attach the LCD assembly. Route the LCD cable along the cable guides.

Figure 12. Removal steps of LCD unit (continued)

Remove the LCD unit in the direction shown by arrows **3**.



1130 CPU

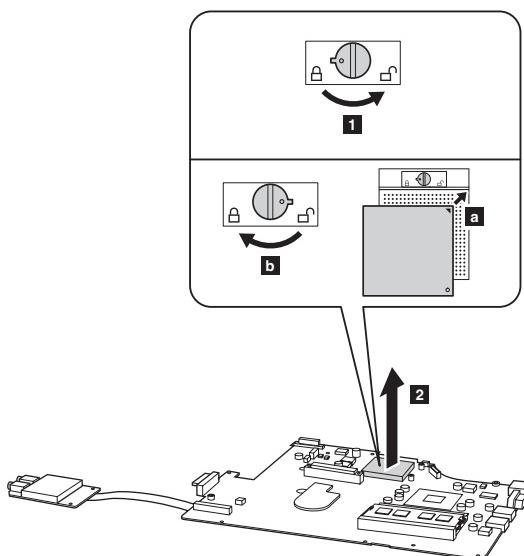
For access, remove these FRUs in order:

- “1010 Battery pack” on page 34
- “1020 Dummy card” on page 35
- “1030 Hard disk drive(HDD)/Memory/Mini PCI Express Card slot compartment cover” on page 36
- “1040 Hard disk drive” on page 37
- “1050 Optical drive” on page 39
- “1060 DIMM” on page 40
- “1070 PCI Express Mini Card for wireless LAN/WAN” on page 41
- “1080 Keyboard” on page 43
- “1100 Keyboard bezel” on page 48
- “1110 System board” on page 53
- “1090 Fan assembly and Heat Sink assembly” on page 46

Attention: CPU is extremely sensitive. When you service the CPU, avoid any kind of rough handling.

Figure 13. Removal steps of CPU

Rotate the head of the screw in the direction shown by arrow **1** to release the lock, then remove the CPU in the direction shown by arrow **2**.



When installing: Place the CPU on the CPU socket in the direction shown by arrow **a**, and then rotate the head of the screw in the direction shown by arrow **b** to secure the CPU.

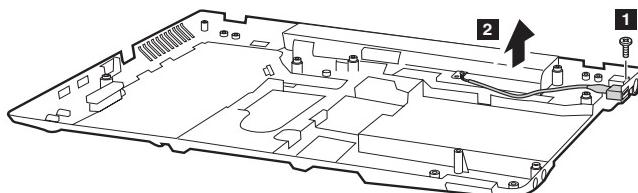
1140 Base cover, speakers and bluetooth card

For access, remove these FRUs in order:

- “1010 Battery pack” on page 34
- “1020 Dummy card” on page 35
- “1030 Hard disk drive(HDD)/Memory/Mini PCI Express Card slot compartment cover” on page 36
- “1040 Hard disk drive” on page 37
- “1050 Optical drive” on page 39
- “1060 DIMM” on page 40
- “1070 PCI Express Mini Card for wireless LAN/WAN” on page 41
- “1080 Keyboard” on page 43
- “1100 Keyboard bezel” on page 48
- “1120 LCD unit” on page 57
- “1110 System board” on page 53

Figure 14. Removal steps of base cover and bluetooth card

Loosen the screw **1**, then remove the USB in the direction shown by arrow **2**.

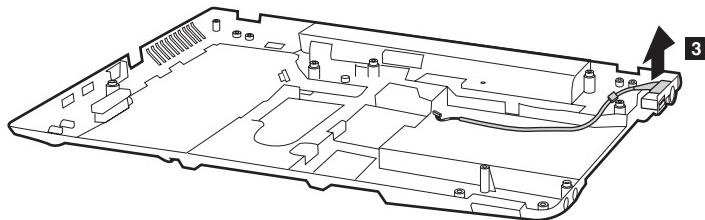


When installing: Make sure that the power connector is attached firmly.

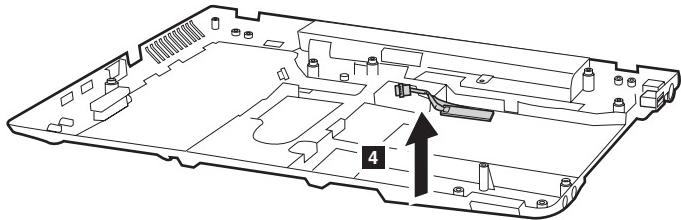
Step	Screw (quantity)	Color	Torque
1	M2 × 3 mm, flat-head, nylok-coated (1)	Black	1.5 ~ 2.0 kgfcm

Figure 14. Removal steps of base cover and bluetooth card (continued)

Remove the power assembly in the direction shown by arrow **3**.



Remove the bluetooth card in the direction shown by arrow **4**.



Note: Applying labels to the base cover

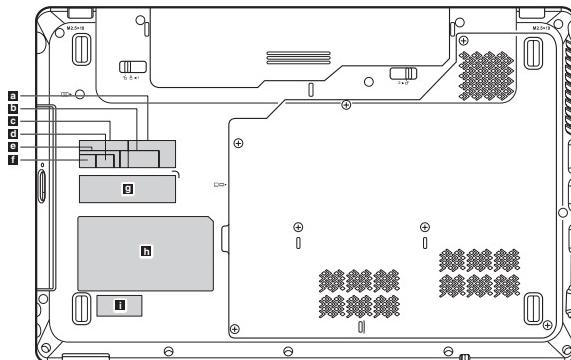
The new base cover FRU is shipped with a kit containing labels of several kinds. When you replace the base cover, you need to apply the following label:

The following labels need to be peeled off from the old base cover, and need to be put on the new base cover.

- a** Brazil Label (BT)
- b** BT Label for US/CA/TW or Indonesia Label for BT
- c** Brazil Label (BT)
- d** Malaysia SIRIM BT Label
- e** WLAN Label for US/CA/TW or Israel LBL for WLAN
- f** Malaysia SIRIM WLAN Label
- g** COA Label
- h** Rating Label
- i** PRC CODE Label

For some models, you also need to apply one or two FCC labels. Check the old base cover; if it has one or two FCC labels, find duplicates of them in the label kit and apply them to the new base cover.

For the location of each label, refer to the following figure:



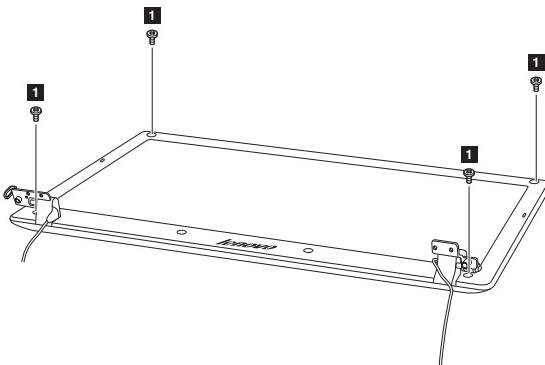
1150 LCD front bezel

For access, remove these FRUs in order:

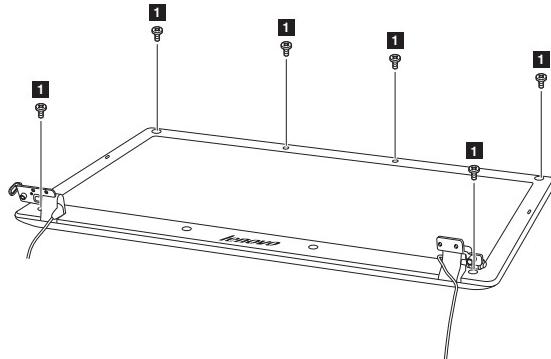
- “1010 Battery pack” on page 34
- “1020 Dummy card” on page 35
- “1030 Hard disk drive(HDD)/Memory/Mini PCI Express Card slot compartment cover” on page 36
- “1040 Hard disk drive” on page 37
- “1050 Optical drive” on page 39
- “1060 DIMM” on page 40
- “1070 PCI Express Mini Card for wireless LAN/WAN” on page 41
- “1080 Keyboard” on page 43
- “1100 Keyboard bezel” on page 48
- “1110 System board” on page 53
- “1120 LCD unit” on page 57

Figure 15. Removal steps of LCD front bezel

G460e: Remove four screws **1**.

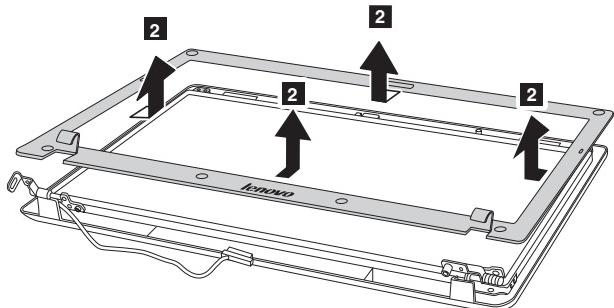


G560e: Remove six screws **1**.



Step	Screw (quantity)	Color	Torque
1	G460e: M2.5 × 5 mm, flat-head, nylok-coated (4) G560e: M2.5 × 5 mm, flat-head, nylok-coated (6)	White	2.0 ~ 2.5 kgfcm

Remove the LCD front bezel in the direction shown by arrows **2**.



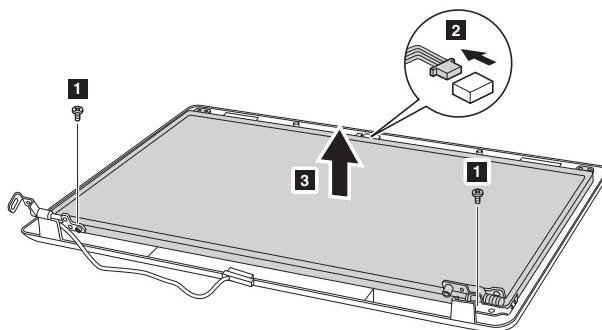
1160 LCD panel, LCD cable and hinges

For access, remove these FRUs in order:

- “1010 Battery pack” on page 34
- “1020 Dummy card” on page 35
- “1030 Hard disk drive(HDD)/Memory/Mini PCI Express Card slot compartment cover” on page 36
- “1040 Hard disk drive” on page 37
- “1050 Optical drive” on page 39
- “1060 DIMM” on page 40
- “1070 PCI Express Mini Card for wireless LAN/WAN” on page 41
- “1080 Keyboard” on page 43
- “1100 Keyboard bezel” on page 48
- “1110 System board” on page 53
- “1120 LCD unit” on page 57
- “1150 LCD front bezel” on page 64

Figure 16. Removal steps of LCD panel, LCD cable and hinges

Remove two screws **1**. Unplug the integrated camera connector in the direction shown by arrow **2**. Lift the LCD panel in the direction shown by arrows **3**.

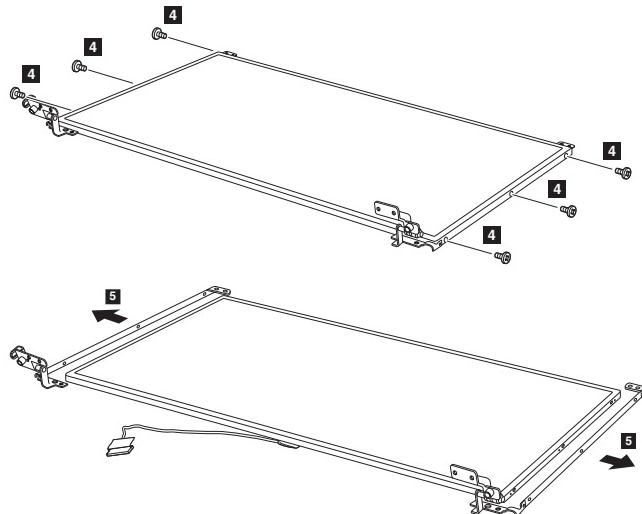


When installing: Make sure that the connector is attached firmly.

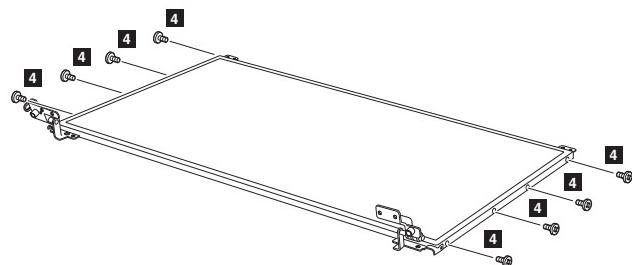
Step	Screw (quantity)	Color	Torque
1	M2.5 × 5 mm, flat-head, nylokcoated (2)	White	2.0 ~ 2.5 kgfcm

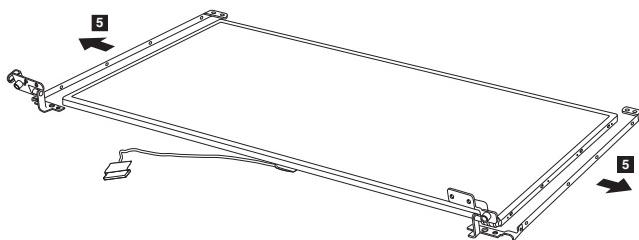
Figure 16. Removal steps of LCD panel, LCD cable and hinges (continued)

G460e: Remove six screws **4** and the hinges in the direction shown by arrows **5**.



G560e: Remove eight screws and the hinges in the direction shown by arrows **5**.



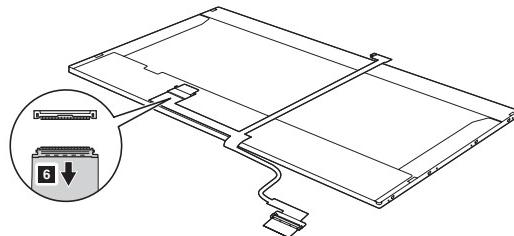


Step	Screw (quantity)	Color	Torque
4	G460e: M2 × 2 mm, flat-head, nylokcoated (6) G560e: M2 × 2 mm, flat-head, nylokcoated (8)	Black	1.5 ~ 2.0 kgfcm

Figure 16. Removal steps of LCD panel, LCD cable and hinges (continued)

Note: The LCD cables are attached to the LCD panel by a metal connector.

Peel off the adhesive tape and detach the connector in the direction shown by arrow **6**.



When installing: Make sure that the metal connector is attached firmly.

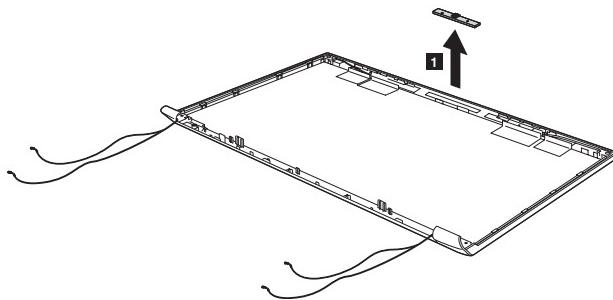
1170 Integrated camera

For access, remove these FRUs in order:

- “1010 Battery pack” on page 34
- “1020 Dummy card” on page 35
- “1030 Hard disk drive(HDD)/Memory/Mini PCI Express Card slot compartment cover” on page 36
- “1040 Hard disk drive” on page 37
- “1050 Optical drive” on page 39
- “1060 DIMM” on page 40
- “1070 PCI Express Mini Card for wireless LAN/WAN” on page 41
- “1080 Keyboard” on page 43
- “1100 Keyboard bezel” on page 48
- “1110 System board” on page 53
- “1120 LCD unit” on page 57
- “1150 LCD front bezel” on page 64
- “1160 LCD panel, LCD cable and hinges” on page 66

Figure 17. Removal steps of integrated camera

Note: The integrated camera is stuck on the top center of the LCD cover. Remove the integrated camera from the LCD cover **1**.



When installing: Stick the integrated camera to the top center of the LCD cover and adjust the placement of it to make sure the connector is attached firmly.

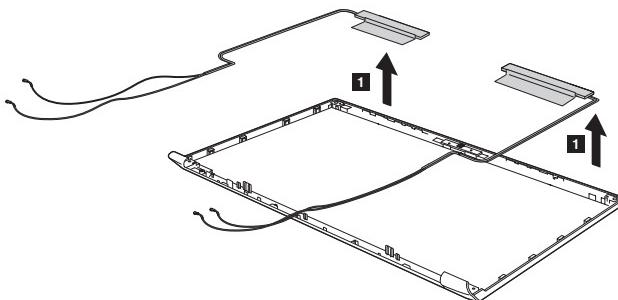
1180 Antenna assembly and LCD cover

For access, remove these FRUs in order:

- “1010 Battery pack” on page 34
- “1020 Dummy card” on page 35
- “1030 Hard disk drive(HDD)/Memory/Mini PCI Express Card slot compartment cover” on page 36
- “1040 Hard disk drive” on page 37
- “1050 Optical drive” on page 39
- “1060 DIMM” on page 40
- “1070 PCI Express Mini Card for wireless LAN/WAN” on page 41
- “1080 Keyboard” on page 43
- “1100 Keyboard bezel” on page 48
- “1110 System board” on page 53
- “1120 LCD unit” on page 57
- “1150 LCD front bezel” on page 64
- “1160 LCD panel, LCD cable and hinges” on page 66

Figure 18. Removal steps of antenna assembly and LCD cover

Peel off the adhesive tapes securing the antenna boards, release the cables from the cable guide, and then remove the antenna assembly in the direction shown by arrows 1.

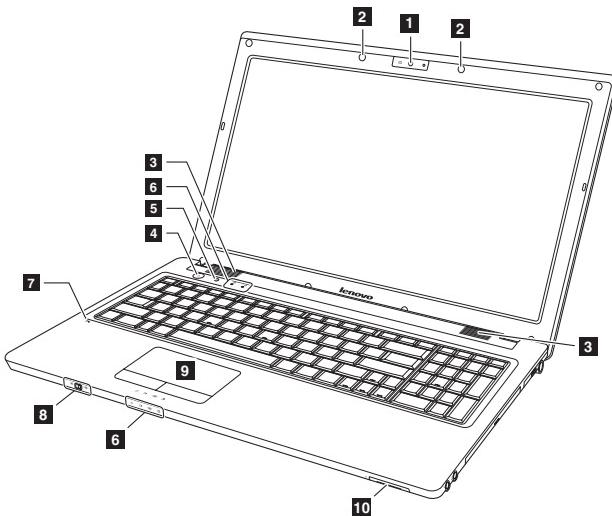


When installing: Route the antenna cables along the cable guides and secure the antenna boards with adhesive tapes. As you route the cables, make sure that they are not subjected to any tension. Tension could cause the cables to be damaged by the cable guides, or a wire to be broken.

Locations

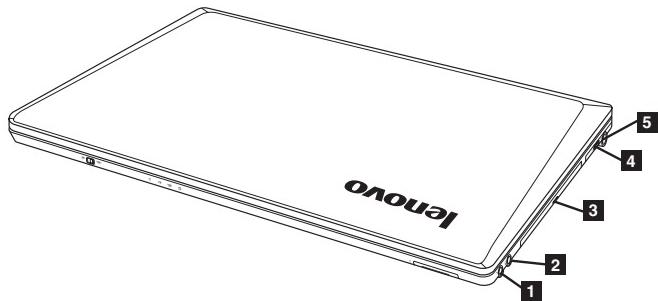
Front view

- 1** Integrated camera (Select models only)
 - 2** Wireless module antennas (Select models only)
 - 3** Speaker
 - 4** Power button
 - 5** OneKey Rescue System button
 - 6** System status indicators
 - 7** Built-in microphone
- Note:** For the description of each indicator, see “Status indicators” on page 29.
- 8** Integrated wireless device switch (Select models only)
 - 9** Touchpad
 - 10** Memory card slot



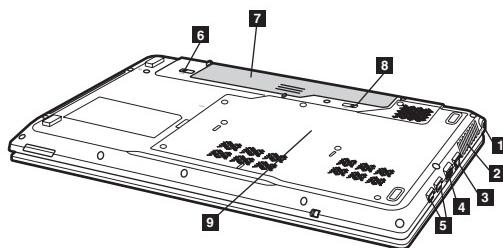
Right-side view

- 1** Headphone jack
- 2** Microphone jack
- 3** Optical drive
- 4** USB port
- 5** AC power adapter jack



Bottom and Left-side view

- 1** Kensington slot
- 2** Fan louvers
- 3** RJ-45 port
- 4** VGA port
- 5** USB port
- 6** Battery latch - spring loaded
- 7** Battery pack
- 8** Battery latch - manual
- 9** Hard disk drive (HDD)/Memory/Mini PCI Express Card slot compartment



Parts list

This section presents the following service parts:

- “Overall” on page 76
- “LCD FRUs” on page 81
- “Keyboard” on page 83
- “Miscellaneous parts” on page 86
- “AC adapters” on page 87
- “Power cords” on page 88

Notes:

- Each FRU is available for all types or models, unless specific types or models are specified.

Overall

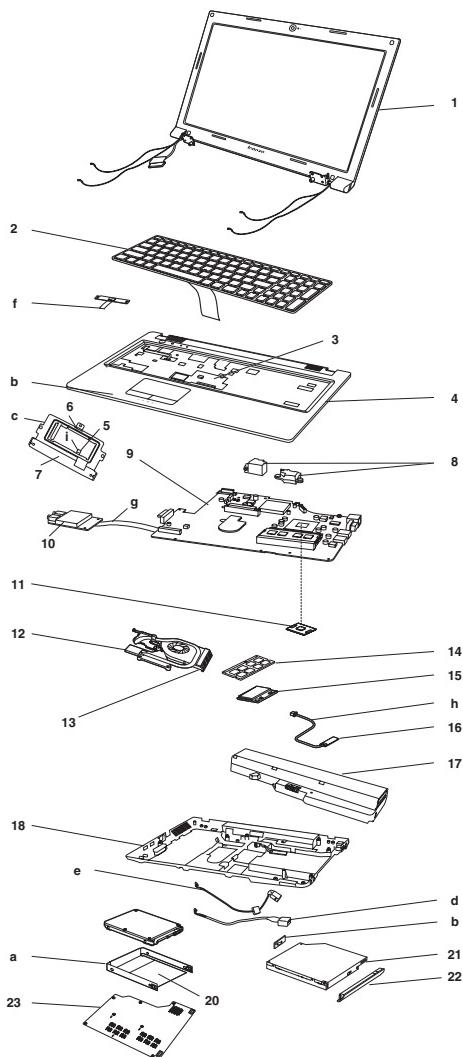


Table 5. Parts list—Overall

No.	FRU	FRU no.	CRU ID
1	LCD unit (see “LCD FRUs” on page 81.)		
2	Keyboard (see “Keyboard” on page 83.)		
3	PAW10 UPPER MYLAR TOP	31049060	N
4	PAW10 LOGIC UPPER ASSY W/TP (G460e)	31049045	N
4	PAW20 LOGIC UPPER ASSY (G560e)	31049052	N
5	NIWE1 TP FFC-14-TEXTURE (G460e)	31044898	N
5	NIWE2 TP FFC-15.6-TEXTURE (G560e)	31044899	N
6	PAW10 TP SYSTEM MYLAR	31049044	N
7	PAW10 UPPER MYLAR BOTTOM	31049061	N
8	NIWE1 SPEAKER SET-14 (G460e)	31042387	N
8	NIWE2 SPEAKER SET-15.6 (G560e)	31042388	N
9	PAW10 MB UMA GM45 10/100M (G460e)	11013322	N
9	PAW10 MB UMA GM45 10/100M WO/BT (G460e)	11013359	N
9	PAW20 MB UMA GM45 10/100M (G560e)	11013324	N
9	PAW20 MB UMA GM45 10/100M WO/BT (G560e)	11013358	N
10	NIWE1 SD DUMMY CARD	31042436	*
11	Intel T6670 2.20G 2M R-0 PGA processor	102000683	N
11	Intel T4500 2.3G 1M R-0 PGA processor	102000771	N
11	Intel T4400 2.2G 1M R-0 PGA processor	102000713	N
11	Intel T4300 2.10G 1M R-0 PGA processor	102000686	N
11	Intel T4200 2.0G 1M R-0 PGA processor	102000586	N
11	Intel T3500 2.10G 1M R-0 PGA processor	102000947	N
11	Intel T3300 2.00G 1M R-0 PGA processor	102000758	N
11	Intel T3000 1.80G 1M R-0 PGA processor	102000689	N
11	Intel T3100 1.90G 1M R-0 PGA processor	102000691	N
11	Intel ICPM 925 2.3G 1M R-0 PGA processorr	102001038	N
12	PAW10 THERMAL MODULE	31049042	N
13	NIWE1 FAN	31042378	N
14	DDRIII 1333 1GB, M471B2873FHS-CH9 (Rev F/1Gb/46nm)	11011936	**
14	DDRIII 1333 1GB, RMT1910MD66E7F-1333 (V69A/2Gb/50nm)	11012427	**

Table 5. Parts list—Overall (continued)

No.	FRU	FRU no.	CRU ID
14	DDR III 1333 1GB, HMT112S6DFR8C-H9 N0 (Rev Vega/1Gb/44nm)	11012767	**
14	DDR III 1333 1GB, RMT3010EF48E7W-1333 (Rev.F/1Gb/60nm)	11012634	**
14	DDR III 1333 1GB, RMT3010EF48E7L-1333 (Rev.F/1Gb/60nm)	11012975	**
14	DDR III 1333 1GB, SY321NG08HBF (Vega/1Gb/44nm)	11012810	**
14	DDR III 1333 2GB, M471B5773CHS-CH9(Rev C/2Gb/46nm)	11012630	**
14	DDR III 1333 2GB, EBJ21UE8BFU0-DJ-F (Rev.F/1Gb/60nm)	11012608	**
14	DDR III 1333 2GB, RMT1950MD58E8F-1333 (V69A/2Gb/50nm)	11012213	**
14	DDR III 1333 2GB, HMT325S6BFR8C-H9 N0 (Rev Vega/2Gb/44nm)	11012197	**
14	DDR III 1333 2GB, RMT3020EF48E8W-1333 (Rev F/1Gb/60nm)	11012633	**
14	DDR III 1333 2GB, RMT3020EF48E8L-1333 (Rev.F/1Gb/60nm)	11012974	**
14	DDR III 1333 2GB, SY321NH08HAF (Vega/2Gb/44nm)	11012809	**
15	WLAN card, 802.11a/g/n && 802.16e, Intel 6250NX MOW M PCIE NB HMC	20002321	**
15	WLAN card, 802.11a/g/n && 802.16e, Intel 6250GX MOW M PCIE NB HMC	20002388	**
15	WLAN card, 802.11a/g/n && 802.16e, Intel 6150NX MOW M PCIE NB HMC	20002484	**
15	WLAN card, 802.11a/g/n && 802.16e, Intel 6150GX MOW M PCIE NB HMC	20002529	**
15	WLAN card, 802.11 b/g/n 1*1, Intel 1000N MOW M PCIE NB HMC	20002329	**
15	WLAN card, 802.11 b/g/n 1*1, Cbt BCM4313 MOW M PCIE NB HMC	20002505	**
15	WLAN card, 802.11 b/g/n 1*1, Liteon AR9285 HB95 BGN MOW NB	20002357	**
15	WWAN card, WCDMA/HSDPA 7.2M, Ericsson F3307 R2 HSPA 900/2100MHz WWAN	11012853	**
15	WWAN card, WCDMA/HSDPA 7.2M, Ericsson F3307 R2 HSPA 850/1900MHz WWAN	11012852	**
15	WWAN card, WCDMA/HSDPA 7.2M, Huawei EM770W WCDMA+GPS MiniPCIE WWAN	11011800	**
15	WWAN card, WCDMA/HSDPA 7.2M, Huawei EM820 HSPA+850/900/1900/2100MHz	11012850	

Table 5. Parts list—Overall (continued)

No.	FRU	FRU no.	CRU ID
15	WWAN card, EVDO, Huawei EM660 EVDO+GPS WWAN card	11012299	**
15	WWAN card, TD-SCDMA, Leadcoretech TD-SCDMA LC5740 Mini-Card	11012849	**
16	Bluetooth card, BT2.1 + EDR, Fcn BCM92070 BT2.1 EDR Flash U NB	20002266	N
16	Bluetooth card, BT2.1 + EDR, USI BCM92070 BT2.1 EDR Flash U NB	20002326	N
17	Battery pack, Sanyo 11.1V 3S2P 4400mAh	121000938	*
17	Battery pack, SMP 11.1V 3S2P 4400mAh	121000935	*
17	Battery pack, LG 11.1V 3S2P 4400mAh	121000937	*
17	Battery pack, G460/G560 SMP 2.2Ah 3S2P Li-ion Battery (B)	121000939	*
17	Battery pack, SMP Eiffel 48Wh 11.1V L09M6Y02	121000992	*
17	Battery pack, Celxpert Z460 3S2P 48Wh LG Li-ion	121000994	*
18	PAW10 LOGIC LOWER (G460e)	31049047	N
18	PAW20 LOGIC LOWER (G560e)	31049054	N
19	Hard disk drive, 250G 5400rpm SATA, WD2500BPVT-24ZEST0 5400RPM 250G	16004852	*
19	Hard disk drive, 250G 5400rpm SATA, Hitachi HTS543225A7A384	16005023	*
19	Hard disk drive, 250G 5400rpm SATA, Seagate ST250LT003 5400RPM 7MM 250G	16005210	*
19	Hard disk drive, 250G 5400rpm SATA, Toshiba MK2565GSX 5400RPM 250G	16004641	*
19	Hard disk drive, 320G 5400rpm SATA, WD 4K sector 320GN 5400RPM250G	16004853	*
19	Hard disk drive, 320G 5400rpm SATA, Hitachi HTS543232A7A384 5400RPM 320G	16005024	*
19	Hard disk drive, 320G 5400rpm SATA, Seagate ST320LT020 5400RPM 7MM 320G	16005211	*
19	Hard disk drive, 320G 5400rpm SATA, Toshiba MK3265GSX 5400RPM 320G	16004642	*
19	Hard disk drive, 500G 5400rpm SATA, Seagate ST9500325AS 500G 9NB	16004189	*
19	Hard disk drive, 500G 5400rpm SATA, WD5000BPVT-24HXZT1 5400RPM 500G	16004846	*
19	Hard disk drive, 500G 5400rpm SATA, Hitachi HTS545050B9A300 500G 9NB	16004058	*
19	Hard disk drive, 500G 5400rpm SATA, Toshiba MK5065GSX 5400RPM 500G	16004643	*
19	Hard disk drive, 750G 5400rpm SATA, WD7500BPVT-24HXZT1 5400RPM 750G	16004848	*
19	Hard disk drive, 750G 5400rpm SATA, TBD	TBD	*
19	Hard disk drive, 750G 5400rpm SATA, TBD	TBD	*

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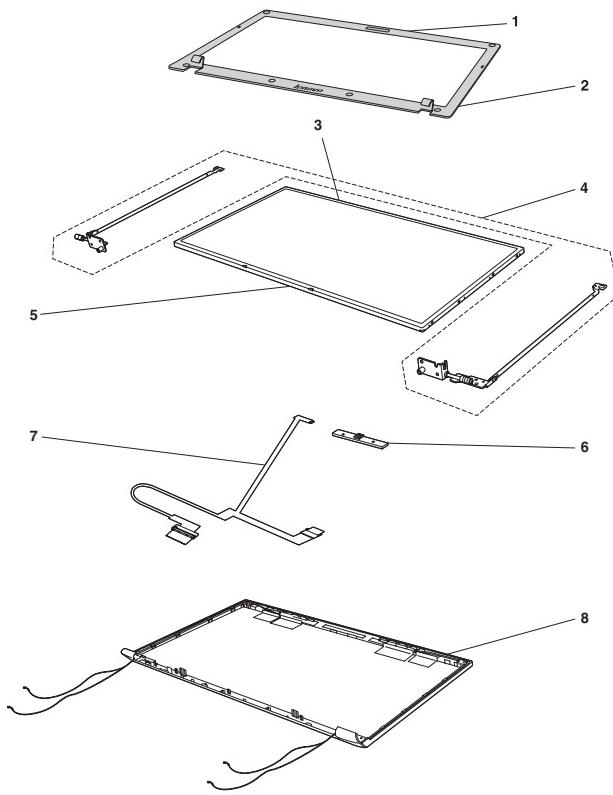
Table 5. Parts list—Overall (continued)

No.	FRU	FRU no.	CRU ID
19	Hard disk drive, 320G 7200rpm SATA, WD WD3200BEKT 7200RPM 320G	16005212	*
19	Hard disk drive, 320G 7200rpm SATA, Hitachi HTS723232A7A364 7200RPM 320G	16005027	*
19	Hard disk drive, 320G 7200rpm SATA, Seagate ST320LT007 7200RPM 7MM 320G	16005030	*
19	Hard disk drive, 500G 7200rpm SATA, Hitachi HTS725050A9A364 7200RPM500G	16004531	*
19	Hard disk drive, 500G 7200rpm SATA, Seagate ST9500420AS 7200RPM500G 9NB	16004532	*
19	Hard disk drive, 500G 7200rpm SATA, WD5000BEKT-24KA9T0 7200RPM 500G	16004850	*
19	ODD, 12.7mm Tray Rambo, HLDS GT33N Tray in Rambo	25011474	**
20	PAW10 MB HDD SPONGE (G460e)	31049062	N
20	PAW20 MB KB MYLAR (G560e)	31049051	N
21	ODD, 12.7mm Tray Rambo, PLDS DS-8A5S Tray in Rambo	25011187	**
21	ODD, 12.7mm Tray Rambo, Optiarc AD-7710H Tray in Rambo	25011218	**
21	ODD, 12.7mm Tray Rambo, PSN UJ8A0 Tray in Rambo	25011472	**
22	NIWE1 ODD BEZEL-SM	31042380	**
23	PAWE7 THERMAL DOOR-14 (G460e)	31045072	**
23	NIWE2 THERMAL DOOR-15.6 (G460e)	31042374	N

LCD FRUs

In Lenovo G460e/G560e, there are following types of LCDs.

- “14.0-in. HD TFT” G460e
- “15.6-in. HD TFT” G560e



14.0-in. HD TFT (G460e)

Table 6. Parts list—14.0-in. HD TFT

No.	FRU	FRU no.	CRU ID
1	PAW10 LCD BEZEL W/CAMERA HOLE	31049048	N
2	NIWE1 SCREW PAD-TEXTURE	31044017	N
3	NIWE1 LED MYLAR-TEXTURE	31044901	N
4	NIWE1 LCD BRACKET 14 R+L	31042433	N
5	14.0 HD LED Panel, B140XW01 V8	18004799	N
5	14.0 HD LED Panel, N140BGE-L21	18004798	N
5	14.0 HD LED Panel, LP140WH4-TLA1	18004797	N
5	14.0 HD LED Panel, LTN140AT16-L01	18004796	N
5	14.0 HD LED Panel, HT140WXB-501	18004795	N
5	14.0 HD LED Panel, CLAA140WB11A	18004794	N
6	NIWE1 CAMERA 0.3M	31042438	N
7	NIWE1 LVDS_COMS CABLE-14	31042429	N
8	PAW10 LCD COVER W/ANT*2, LOGO	31049050	N

15.6-in. HD TFT (G560e)

Table 7. Parts list—15.6-in. HD TFT

No.	FRU	FRU no.	CRU ID
1	PAW20 LCD BEZEL W/CAMERA HOLE	31049055	N
2	NIWE1 SCREW PAD-TEXTURE	31044017	N
3	NIWE1 LED MYLAR-TEXTURE	31044901	N
4	NIWE2 LCD BRACKET 15.6 R+L	31042434	N
5	15.6 HD LED Panel, B156XW02 V2	18003797	N
5	15.6 HD LED Panel, N156BGE-L21	18004787	N
5	15.6 HD LED Panel, LP156WH4-TLA1	18004786	N
5	15.6 HD LED Panel, LTN156AT16-L01	18004785	N
5	15.6 HD LED Panel, HT156WXB-500	18004783	N
5	15.6 HD LED Panel, CLAA156WB11A	18004563	N
6	NIWE1 CAMERA 0.3M	31042438	N
7	NIWE2 LVDS_COMS CABLE-15.6	31042430	N
8	PAW20 LCD COVER W/ANT*2, LOGO	31049057	N

Keyboard

Table 8. Parts list—Keyboard

Language	P/N	CRU ID
Chicony	International English	25009852
	Swiss	25009853
	Slovenian	25009854
	Slovak	25009855
	Icelandic	25009856
	Bulgarian	25009857
	Four Nordic countries	25009858
	Hungarian	25009859
	Hebrew	25009860
	Greek	25009861
	Dutch	25009862
	Czech	25009882
	Japanese	25009883
	Brazilian	25009884
	Arabic	25009885
	German	25009886
	French	25009887
	Russian	25009888
	Traditional Chinese	25009889
	Korean	25009890
	Canadian English&French	25009891
	Latin	25009892
	Portuguese	25009893
G460e	Thai	25009894
	Turkish	25009895
	Spanish	25009896
	Italian	25009897
	U.K. English	25009898
	English	25009751
	Bulgarian	25010509
	Czechoslovakian	25011160
	International English	25009786
	Swiss	25009787
	Slovenian	25009788
	Slovak	25009789
	Icelandic	25009790
	Bulgarian	25009791
Sunrex	Four Nordic countries	25009792
	Hungarian	25009793
	Hebrew	25009794
	Greek	25009795
	Dutch	25009796
	Czech	25009797
	Japanese	25009798
	Brazilian	25009799
	Arabic	25009800
	German	25009801
	French	25009802

Table 8. Parts list—Keyboard

Language		P/N	CRU ID	
G460e (continued)	Sunrex (continued)	Russian	25009804	**
		Traditional Chinese	25009805	**
		Korean	25009806	**
		Canadian English&French	25009807	**
		Latin	25009808	**
		Portuguese	25009803	**
		Thai	25009831	**
		Turkish	25009832	**
		Spanish	25009833	**
		Italian	25009834	**
		U.K. English	25009835	**
		English	25009750	**
		Bulgarian	25010562	**
		Czechoslovakian	25011126	**
G560e	Chicony	German	25009811	**
		Arabic	25009812	**
		Brazilian	25009813	**
		English	25009755	**
		U.K. English	25009873	**
		Italian	25009874	**
		Spanish	25009875	**
		Turkish	25009876	**
		Thai	25009877	**
		Portuguese	25009878	**
		Latin	25009879	**
		Korean	25009880	**
		Traditional Chinese	25009881	**
		Russian	25009809	**
		French	25009810	**
		Japanese	25009814	**
		Czech	25009816	**
		Dutch	25009818	**
		Greek	25009817	**
		Hebrew	25009819	**
		Hungarian	25009815	**
		Belgian	25009820	**
		Icelandic	25009821	**
		Slovak	25009822	**
		Slovenian	25009823	**
		Swiss	25009824	**
		International English	25009825	**
		Canadian English&French	25009826	**
		Four Nordic countries	25009827	**
		Bulgarian	25009588	**
		Czechoslovakian	25011159	**

Table 8. Parts list—Keyboard (continued)

Language		P/N	CRU ID
G560e (continued)	Sunrex (continued)	German	25009958
		Arabic	25009959
		Brazilian	25009960
		English	25009754
		U.K. English	25009929
		Italian	25009961
		Spanish	25009962
		Turkish	25009963
		Thai	25009964
		Portuguese	25009965
		Latin	25009966
		Korean	25009967
		Traditional Chinese	25010117
		Russian	25009969
		French	25009970
		Japanese	25009922
		Czech	25009971
		Dutch	25010118
		Greek	25010119
		Hebrew	25010120
		Hungarian	25009863
		Belgian	25009864
		Icelandic	25009865
		Slovak	25009866
		Slovenian	25009867
		Swiss	25009868
		International English	25009869
		Canadian English&French	25009870
		Four Nordic countries	25009871
		Bulgarian	25009872
		Czechoslovakian	25011125

Miscellaneous parts

Table 9. Parts list—Miscellaneous parts

FRU	P/N	CRU ID
System miscellaneous parts: <ul style="list-style-type: none"> • (a) NAWE5 HDD BRACKET (G460e) • (a) NIWE1 HDD BRACKET (G560e) • (b) NIWE1 ODD BRACKET • (c) NIWE1 TP BRACKET 	31044387 31042377 31042381 31044897	N
Cable miscellaneous parts: <ul style="list-style-type: none"> • (d) NIWE1 USB CABLE-14 (G460e) • (d) NIWE2 USB CABLE-15.6 (G560e) • (e) NIWE1 DC-IN CABLE-14 (G460e) • (e) NIWE2 DC-IN CABLE-15.6 (G560e) • (f) PAW10 POWER BOARD W/FFC (G460e) • (f) PAW20 POWER BOARD W/CABLE (G560e) • (g) PAW10 AUDIO BOARD W/CABLE (G460e) • (g) PAW20 AUDIO BOARD W/CABLE (G560e) • (h) NIWE1 BT CABLE • (i) PAW10TP BOARD W/TP CABLE 	31042398 31042399 31042401 31042402 11013321 11013323 31049046 31049053 31042403 31049043	N

Note: Italicized letters in parentheses are references to the exploded view in “Overall” on page 71.

AC adapters

Table 10. Parts list—3-pin AC adapters

FRU	P/N	CRU ID
65W, Delta ADP-65KH BD 20V/3.25A adapter	36001929	N
65W, Liteon PA-1650-56LC adapter	36001651	N
65W, Brazil PA-1650-52LB	36001714	N
65W, Chicony CPA-A065 20V3.25A adapter	36001943	N

Power cords

A Lenovo power cord for a specific country or region is usually available only in that country or region:

Table 11. Parts list—3-pin power cords

Region	P/N	CRU ID
CCC	145000602	*
• SSD YD-118-1+IEC53RVV+SSD-3-2B-1 1m		
CCC	145000600	*
• LINETEK PC323+RVV300/300+LS15 1m		
Argentina	145000599	*
• LINETEK LS15+H03VV-F+LP39 1m		
Danmark	145000598	*
• LINETEK LS15+H03VV-F+LP-38 1m		
Switzerland	145000597	*
• LINETEK LS15+H03VV-F+LP-37 1m		
Brazil	145000596	*
• LINETEK LS15 H03VV-F LP26A 1m		
Israel	145000595	*
• LINETEK LS15+H03VV-F+LP-41 1m		
UL	145000594	*
• LINETEK LP-30B + SPT-2 + LS15 1m		
UK	145000593	*
• LINETEK LP-61L+ H03VV-F+ LS15 1m		
Indian	145000592	*
• LINETEK PE-361+ H05VV-F+ LS15 1m		
Italy	145000591	*
• LINETEK LS15+H03VV-F+PE-336 1m		
Korea	145000590	*
• LINETEK LS15+H05VV-F+LP-E04A 1m		
Australia	145000589	*
• LINETEK LS15+H03VV-F+LP-23A 1m		
Taiwan	145000588	*
• LINETEK LS15+VCTF+LP-53 1m		
Japan	145000587	*
• LINETEK LS15+VCTF+LP-54 1m		
Africa	145000586	*
• LINETEK LS15+H03VV-F+PE-364 1m		
CE	145000585	*
• LINETEK LP-34+H03VV-F + LS15 1m		
Argentina	145000567	*
• Longwell LP-24+H03VV-F+LS-18 1m		
Danmark	145000566	*
• Longwell LP-40+H03VV-F+LS-18 1m		
Switzerland	145000565	*
• Longwell LP-37+H03VV-F+LS-18 1m		

Table 11. Parts list—3-pin power cords (continued)

Region	P/N	CRU ID
Brazil	145000564	*
• Longwell LP-46+H03VV-F+LS-18 1m		
Israel	145000563	*
• Longwell LP-41+H03VV-F+LS-18 1m		
UL	145000562	*
• Longwell LP-30B+SPT-2 18AWG+LS-18 1m		
UK	145000561	*
• Longwell LP-61L+H03VV-F+LS-18 1m		
Indian	145000560	*
• Longwell LP-67+BIS+LS-18 1m		
Italy	145000559	*
• Longwell LP-22+H03VV-F+LS-18 1m		
Korea	145000558	*
• Longwell LP-486+KTLH03VV-F+LS-5 1m		
Australia	145000557	*
• Longwell LP-23A+LFC-3R+LS-18 1m		
Taiwan	145000556	*
• Longwell LP-71+VCTF+LS-33 1m		
Japan	145000555	*
• Longwell LP-54+VCTF+LS-18 1m		
Africa	145000554	*
• Longwell LP-39+H03VV-F+LS-18 1m		
CE	145000553	*
• Longwell LP-34A+H03VV-F+LS-18 1m		
CCC	145000538	*
• Volex LSG-31+RVV300/300+LS-18 1m		
Argentina	145000528	*
• Volex LP-24+H03VV-F+LS-18 1m		
Danmark	145000534	*
• Volex LP-40+H03VV-F+LS-18 1m		
Switzerland	145000524	*
• Volex LP-37+H03VV-F+LS-18 1m		
Brazil	145000527	*
• Volex LP-46+H03VV-F+LS-18 1m		
Israel	145000526	*
• Volex LP-41+H03VV-F+LS-18 1m		
UL	145000537	*
• Volex LP-30B+SPT-2 18AWG+LS-18 1m		
UK	145000605	*
• Volex LP-61L+H03VV-F+LS-18 1m		
Indian	145000536	*
• Volex LP-67+BIS+LS-18 1m		
Italy	145000535	*
• Volex LP-22+H03VV-F+LS-18 1m		

Table 11. Parts list—3-pin power cords (continued)

Region	P/N	CRU ID
Korea • Volex LP-486+KTLH03VV-F+LS-5 1m	145000533	*
Australia • Volex LP-23A+LFC-3R+LS-18 1m	145000532	*
Taiwan • Volex LP-71+VCTF+LS-33 1m	145000531	*
Japan • Volex LP-54+VCTF+LS-18 1m	145000530	*
CE • Volex LP-34A+H03VV-F+LS-18 1m	145000525	*

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